SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXV.—No. 17. [NEW SERIES.] NEW YORK, OCTOBER 21, 1871. $3 per Annum. [IN ADVANCE.]

Improved Universal Wood Working Machine.

A primitive form of this machine was illustrated on page 79, Vol. XXIII., of this journal. In the machine, as herewith illustrated, the essential and valuable features of the original invention are retained, while its scope is so much enlarged that it probably performs a greater variety of work than any machine now in use, and the character of the work is very perfect, as shown in a large number of specimens sent to this office.

The specimens illustrate the following kinds of work, namely: squaring, planing out of wind, beveling, cornering, rabbeting, gaining and plowing, planing tapered sticks, gaining $4\frac{1}{2}$ inches in width by $3\frac{1}{2}$ inches in depth (done at one cut) gains cut so close to others as to leave only a mere film of wood between them, plowing and gaining with the same cutter head, gaining at different angles, glue joints of newel posts, mitering, tongueing, and grooving, rolling joints, table leaves straight molding (several specimens in hard and soft wood), circular and elliptical molding, raised paneling, (the panel being raised on both sides of the piece at one operation), journals for agricultural machinery, picket pointing, gaining cuts made in one operation for journal boxing of different shapes, routing for bed post irons, window sash, light molding, etc.

The machine differs from the one illustrated in our issue of August 6, 1870, in the following particulars:

The present machine is made entirely of iron and steel. It has a "sticker" attachment to plane one, two, three, or four sides at one operation, so that, as now made, it may be run with five heads, one of them on the front side, for the same purpose as stated in our former article, and four on the sticker side for the various purposes to which a "sticker," or molding, machine is applicable.

The feed of the machine is made stronger than formerly, and is improved in other respects, making it now, it is claimed, the best parallel feed in use.

The position of the outer side head is so changed that the belt pulls against the boxes, and not against the cap, as is generally the case with other stickers, by which means the side head is held steady and makes a smoother cut.

The drop of the sticker bed has been much increased, having now a depth of eighteen inches.

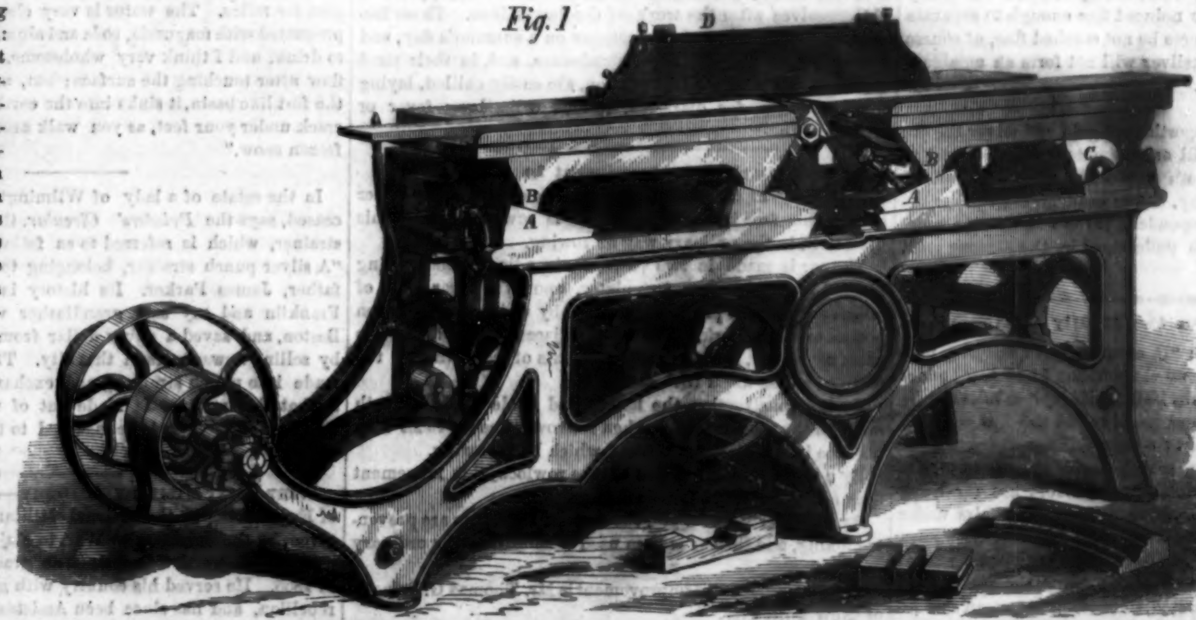
We may add, to what we have said above, with reference to the variety of work done by this machine, that our enumeration does not comprise all that is done by it. There is scarcely a shape in which it is desirable to form wood in carriage making, car building, or furniture manufacturing, which is beyond the limits of its capacity.

Referring now to the engravings, Figs. 1 and 2 show obverse sides of the machine. We must of necessity omit many of the details, but will point out some of the principal features of construction.

In Fig. 1 the vertical adjustment of the tables is shown, this being accomplished through the action of inclined planes, A, simultaneously and equally moved by hand screws, C. Upon these planes rest the inclines, B, which support the table. D is the fence made of iron, and capable of adjustment to any angle with the table. It will be seen in Fig. 1 that there are two independent tables, one on each side of the cutter head, so that the piece to be planed rests on a solid surface on each side of the cutter bits, and is thus planed out of wind. By adjusting the fence properly, any bevel may be planed.

The sticker side of the machine, shown in Fig. 2, is provided with boring, routing, and other attachments for performing the various kinds of work above specified.

Fig. 1

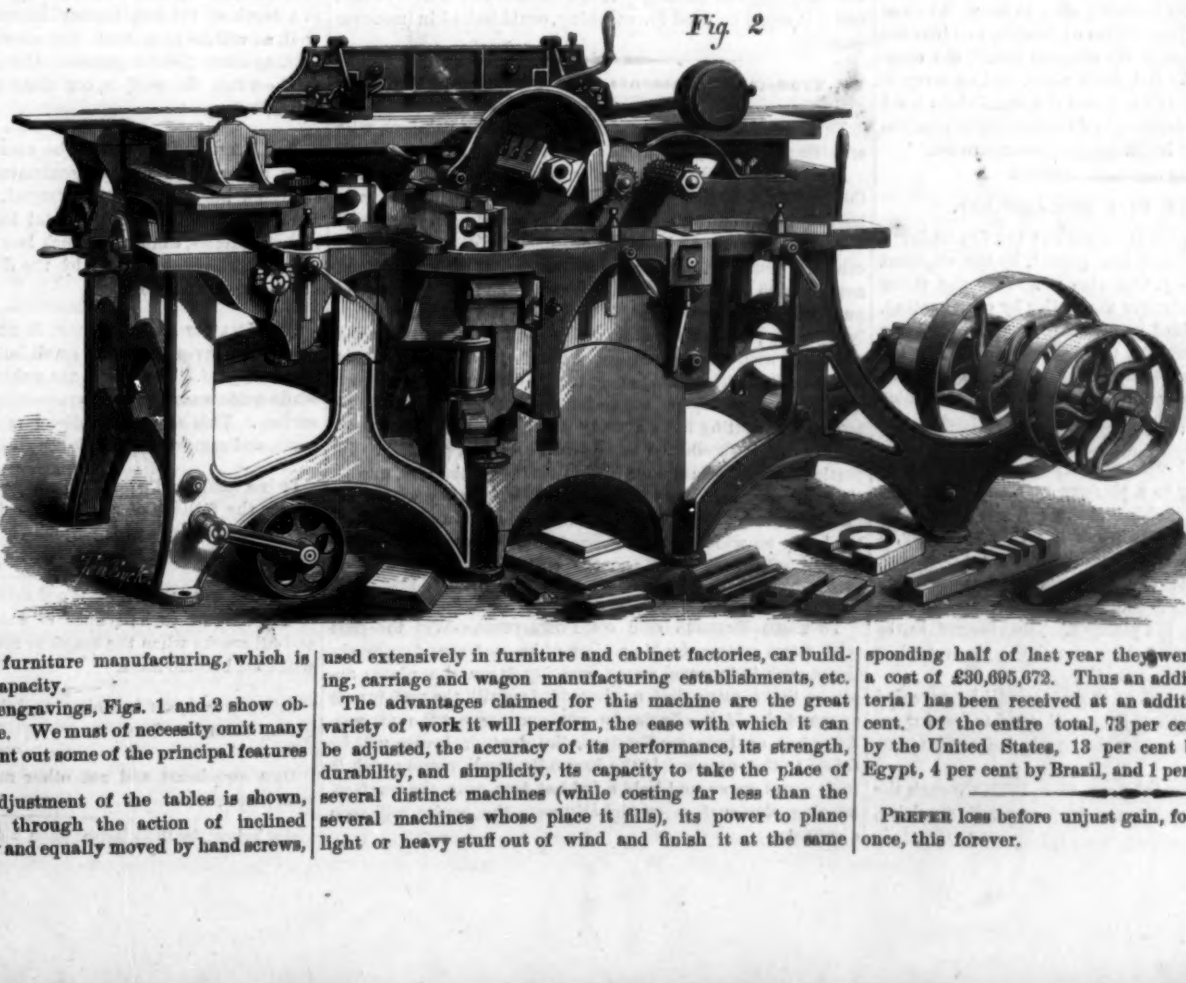


McBETH, BENTEL & MARGEDANT'S UNIVERSAL WOOD WORKING MACHINE.

The manufacturers also make an universal wood worker with boring and routing attachment, without the sticker attachment.

The machine herewith represented has been used with great satisfaction in some of the best shops in the country, some manufacturers having purchased several machines for the same shop, after a trial of one. Among a large number of testimonials submitted to us, is one from the Barney & Smith Manufacturing Company, of Dayton, Ohio, an extensive car building firm, in which they say they consider that any one of the three machines they have purchased (the first in 1868, the second in 1869, and the third in 1870) paid for itself in the first four months of its use. The machines are used extensively in furniture and cabinet factories, car building, carriage and wagon manufacturing establishments, etc.

Fig. 2



The advantages claimed for this machine are the great variety of work it will perform, the ease with which it can be adjusted, the accuracy of its performance, its strength, durability, and simplicity, its capacity to take the place of several distinct machines (while costing far less than the several machines whose place it fills), its power to plane light or heavy stuff out of wind and finish it at the same operation, and the economy of bench work it accomplishes.

By changing the heads of the machine, it is readily adapted to the kind of work required, thus obviating the necessity of carrying the material to different parts of the shop to be worked. The machine is covered by several patents, all obtained through the Scientific American Patent Agency. For purchase of rights or machines, address McBeth, Bentel & Margedant, manufacturers, Hamilton, Ohio.

Coloring Gold.

Gold is colored by two processes, called the dry and wet color; but the materials used in both cases are the same. They are as follows; one part salt, one part alum, and two parts saltpeter; each material to be pounded separately in a mortar, taking care they are perfectly clean—this is the dry process.

After being well pounded, they are put into an iron color pot and slowly heated over a fire. The color must boil gradually, and must be stirred with an iron rod. It will then rise, and then it is ready for the reception of the articles to be colored, which must be not less than 18 carat. They are suspended in the color by 18 carat wire, and kept in motion till the liquid begins to sink; then they are taken out and dipped in aquafortis pickle. The color will rise again, and then another dip, and sometimes two, is necessary to give the proper color. The wet color process is a much inferior method, except for gold of lower standard, and then not below 15 carat, as the alloy would suffer so seriously from the coloring. The fact is, coloring is no more than taking from the surface the inferior metals, leaving a thin coating of pure gold.

Breadstuffs and Cotton Imported into Great Britain.

The breadstuffs received by Great Britain during the half year ending June 30, 1871, were of the value of £16,170,861, being an increase of about $12\frac{1}{2}$ per cent over the corresponding period of last year. The importations were derived as follows: From Russia, 40 per cent; America, 38 per cent; Germany, 9 per cent; Canada, 5 per cent; Turkey, 4 per cent; Austria, 1 per cent; Chili, 1 per cent, and other countries, 2 per cent. Compared with the first half of each of the preceding two years, Russia and Canada figure for a large increase, while Germany shows a decrease. The United States show a decrease from last year, but a large increase of 1869.

The importations of cotton for the first half of the present year have amounted to 9,708,245 cwts, at a cost of £33,506,876 while in the corresponding half of last year they were only 5,895,116 cwts, at a cost of £30,695,672. Thus an additional 65 per cent of material has been received at an additional cost of only $9\frac{1}{4}$ per cent. Of the entire total, 73 per cent has been contributed by the United States, 13 per cent by India, 9 per cent by Egypt, 4 per cent by Brazil, and 1 per cent by other countries.

PREFER loss before unjust gain, for that brings grief but once, this forever.

COLORADO ORES.

An esteemed correspondent, Mr. Percival Stockman, in writing on the above subject, agrees with our editorial (published August 12, on page 103 of the present volume), that the enormous and shameful waste is a standing disgrace to technical science. He challenges the accuracy of Mr. John A. Church's statement (October 7, page 228), that "it is apparently impossible to amalgamate Colorado ores," and asks: "Why? The reason is that no process has hitherto been discovered to neutralize and separate the impurities invariably found in combination, not only with Colorado ores, but in all gold, and in different species of silver, ores." He describes arsenic, iron, and antimony, each in various forms, as the chief foreign bodies which cause difficulty, and states that "these impurities, coming in contact with the quicksilver, deaden and destroy its affinity for the precious metals;" but let the obstacles be removed, and then "tell any scientific man that gold and silver will not form an amalgam with quicksilver."

"The various different species of silver ores, that is, native silver, sulphuret of silver, brittle sulphuret of silver, antimonial silver, sulphuretted antimonial silver (red silver), carbonate of silver, muriate of silver (horn silver), and argillaceous muriate of silver, can all be amalgamated without any loss, provided that they are reduced fine enough to separate the metallic bodies. If the ores be not crushed fine, of course there will be loss, as quicksilver will not form an amalgam with the earthy substances."

He further asserts that:

"It matters not what proportions of gold and silver the ore contains, the quicksilver will amalgamate with one metal as well as the other, and both together. First remove its enemies, and give it fair play, before condemning it."

At all events, our correspondent throws light on a most important subject, too little understood by the persons most concerned.

Effect of Exercise upon the Bodily Temperature.

Dr. Clifford Allbutt says: "It seems absurd to tell a man who is toiling up a steep snow slope about 11.45 A. M., under a blazing sun, that, if he thinks he is decidedly hot, he is wholly in error, and that his temperature, if raised at all, is raised in a measure only perceptible to a very delicate thermometer. . . . . . I may venture, perhaps, with more impunity to reassert this fact now, as most of my readers are far away from slopes of 45°, and are shivering in their easy chairs under the rigors of an English spring. Men of science have shown that all forms of force, such as heat, light, motion, chemical action, and the like, are mutually convertible, the one into the other. . . . It might be expected, therefore, that a man ascending the Alps would lose in heat what he expends in movement; for, on his arrival at the top, he represents a certain definite amount of force derived from combustion of food in his body . . . . . . The average temperature of the human body is about 98·5° Fahr., and it may vary between 97·5° and 99·2°, with a few tenths of indifference above and below. To rise to 100° is, however, to become slightly but decidedly feverish, and temperatures of 105°—110° are positively and rapidly destructive. On the other hand, temperatures below 97° show danger of an opposite kind, and signify a depression of vitality below the limits of health. It is clear, then, that if the body is to survive, its temperature must preserve a constant level, or rather it must move in a definite curve, the place of which is constant for the same hour of every day, or nearly so. . . . I am disposed to think that no better test could be found than the thermometer to decide the wholesomeness of exertion in different persons; and if I may reason from myself to others I should say that the effect of hard exercise in a mountainous district is to accelerate the morning rise, to carry it two or three tenths above the average level of health, to favor the somewhat earlier occurrence of the evening fall, if the exertion be ended, to make the fall more rapid, and to carry it again one tenth, or perhaps two, below the usual night level of health. Also, that any depression during exertion signifies either deficiency of food or inefficiency of internal work.'"

Sinclaire's Boiler Fire Extinguisher.

The object of this invention is to put out the fire under a boiler, whenever the pressure has passed, by the slightest amount, the limit of safety, and also whenever the water has fallen so low as to endanger the boiler by over heating.

The first object is attained by means of a weighted lever in a locked and sealed chamber; the weight (to be set by the inspector,) controls a valve that, raised by any pressure beyond that to which the weight is set, opens a part which allows water to flow from the boiler into the furnace and extinguish the fire.

The second part of the invention is a pipe, in which a fusible plug is placed, leading to a plunger in a small cylinder. The pipe in the ordinary working of the boiler is filled with water, but when the water falls below the line of safety, it opens the end of the pipe which was closed by the water, and, the water being displaced by the steam, (the heat of which first melts the fusible plug,) the latter passes on into the cylinder, which forces up the plunger. The plunger in rising raises the weighted lever and allows the water to flow into the furnace as above described.

The knowledge that neglect on their part will be revealed by the extinguishment of their fires, will tend to render engineers cautious, and thus reduce the number of accidents resulting from negligence.

This invention was patented Sept. 19th, 1871, through the Scientific American Patent Agency, by Thomas B. Sinclaire, of New York city.

Curiosities of Life.

Lay you finger on your pulse, and know that, at every stroke some immortal passes to his Maker; some fellow being crosses the river of death; and if we think of it we may well wonder that it should be so long before our turn comes.

Half of all who live die before seventeen.

Only one person in ten thousand lives to be one hundred years old, and but one in a hundred reaches sixty.

The married live longer than the single.

There is one soldier to every eight persons, and, out of every thousand born, only ninety-five weddings take place.

If you take a thousand persons who have reached seventy years, there are of

Clergymen, orators and public speakers	43
Farmers	40
Workmen	33
Soldiers	32
Lawyers	29
Professors	27
Doctors	24

These statements are very instructive. Farmers and workmen do not arrive to good old age as often as the clergymen and others who perform no manual labor; but this is owing to the neglect of the law of health, inattention to proper habits of life in eating, drinking, sleeping, dress, and the pr per care of themselves after the work of the day is done. These farmers or workmen eat a heavy supper on a summer's day, and sit around the doors in their shirtsleeves, and, in their tired condition and weakened circulation, are easily chilled, laying the foundation for diarrhœa, bilious colic, lung fever or consumption.

Pringle's Improvement in Oars.

By the use of these improved oars, the oarsman may either sit with his face in the direction he is rowing, or with his back to it, in the ordinary way of rowing.

The oar is made in two parts, their adjacent ends being pivoted to and between two plates, upon the outer sides of which are formed pivots or journals, by which the oar is connected to the oarlock. Upon the adjacent ends, of the two parts of the oar, are attached segments of gear wheels, the teeth of which mesh with each other.

By this construction, the handle and blade of the oar both move in the same direction when the rower desires to sit with his face in the direction toward which he is rowing.

By a peculiar construction of the rowlock, this movement does not prevent feathering the oar.

By the insertion of a pin, the toothed segments are prevented acting, and the oar is then used exactly like the ordinary oar.

The inventor of this improvement is Mr. Thomas G. Pringle, of New York City.

Extract of Horse Chestnut Wood.

For dyeing heavy black upon silk, an extract of horse chestnut wood has recently acquired great importance. It is preferred to nut galls or dividivi for this purpose. To what particular principle in the wood is to be ascribed the important property, of which use is now made, has not been determined with certainty, but it appears to be ascertained that the extractive matter of horse chestnut wood now plays an important part in the silk manufacture in Europe. The question is not one of so much importance in this country as as it is in France and Germany, but it ought to occasion a search to be made for some suitable substitute. We doubtless have in our forests trees that would yield a similar product if they were to be examined. There is a weed growing in great abundance in New England known as *hard hack*, which ought to be examined with reference to its possible use in dyeing and tanning. It is a nuisance as it now exists, and if it could be used for anything, could be had in immense quantity.

To Transfer Ornaments for Carriages, Wagons, etc.

This beautiful art is now practiced by many painters, who are either in a hurry with their work, or for economy's sake.

Pictures expressly designed for carriages are now sold at the leading periodical stores, and the amateur painter is enabled thereby to finish a job of carriage painting in fine style.

These pictures may be stuck on, and the dampened paper carefully removed, leaving the picture intact upon the panel, requiring no touching with the pencil. The proper way to put on decalcomine pictures is to varnish the picture carefully with the prepared varnish (which can be obtained with the pictures,) with an ornamenting pencil, being sure not to get the varnish on the white paper. In a few minutes, the picture will be ready to lay on the panel, and the paper can be removed by wetting it, as already described; and when thoroughly dry, it should be varnished like an oil painting. Be particular to purchase none of those transfer pictures, except those covered with gold leaf on the back, for they will show plainly on any colored surface, while the plain pictures are used only on white or light grounds. They may be procured at any stationery store, and the cost is trifling.—*Painter's Manual.*

TO TAKE BRUISES OUT OF FURNITURE.—Wet the part with warm water; double a piece of brown paper five or six times, soak it in warm water, and lay it on the place; apply on that a warm, but not hot, flat iron till the moisture is evaporated. If the bruise be not gone, repeat the process. After two or three applications, the dent or bruise will be raised to the surface. If the bruise be small, merely soak it with warm water, and hold a red hot iron near the surface, keeping the surface continually wet—the bruise will soon disappear.

EDITORIAL SUMMARY.

THE wire rope works of Messrs. John A. Roebling & Sons are the largest in the United States, occupying an area of about ten acres, located on the Delaware and Raritan Canal and connected with the Camden and Amboy Railroad. Bright wire, steel, and galvanized wire rope in all sizes and lengths are made, and the machinery is capable of making as large wire rope as can be manufactured. One piece, 5,870 feet feet long, weighing 65,000 pounds, was recently made for the Lehigh and Susquehanna Railroad, costing $10,540. The business was first started in 1849, and now employs 125 hands and three engines, giving in all 350 horse power. A rolling mill in connection with the works has a capacity for forty tuns of wire per week. A new building, to be 200x40, is now being built for a galvanizing house.

SALT LAKES IN AUSTRALIA.—An interesting description of the salt lakes of Australia is given by a writer in the Sydney *Empire*, who, speaking of the salt lakes and mineral springs on the Paroo, says: "These wells are a real curiosity to many, if not to all. Mounds of earth rise about ten or fifteen feet over the surface, no doubt thrown up by the force of the water; they form a kind of oasis in the wilderness, and have saved the lives of many weary wanderers. These mounds can be seen for miles. The water is very clear and soft. It is impregnated with magnesia, soda and alum. It is very palatable to drink, and I think very wholesome. The water does not flow after touching the surface; but, as soon as it overflows the fort like basin, it sinks into the earth. The alum and soda crack under your feet, as you walk around these wells, like frozen snow."

In the estate of a lady of Wilmington, Del., recently deceased, says the *Printers' Circular*, there is a silver punch strainer, which is referred to as follows in the lady's will: "A silver punch strainer, belonging to my maternal grandfather, James Parker. Its history is briefly this: Dr. B. Franklin and my said grandfather were printer boys in Boston, and saved a silver dollar from their first earnings by selling newspapers in that city. They had these dollars made into punch strainers, and exchanged with each other, so that this strainer is made out of the dollar earned by Dr. Franklin. This is bequeathed to the Smithsonian Institute."

WEST POINT MILITARY ACADEMY.—The post of Professor of Engineering at the national Military Academy has been given, by the Secretary at War, to Major Junius B. Wheeler, a native of North Carolina, who graduated at West Point in 1855. He served his country with great credit during the rebellion, and has since been Assistant Professor of Mathematics in the Military Academy aforesaid. The appointment will have the approval of the military profession and the public, as well of the cadets, with whom Professor Wheeler is already popular.

INEXTINGUISHABLE LAMP.—A new light, which seems fitted to be of use in submarine construction of works, is in use in England. It is a cylinder of tin, with a top filled with a phosphide of calcium, prepared by the inventor, a Mr. Holmes. When the lamp is thrown into the sea or river, the water, entering the cylinder, decomposes the phosphide of calcium, phosphuretted hydrogen results; the latter escaping in great quantities ignites spontaneously, and burns with a brilliant light.

LARGE WELL IN OHIO.—A correspondent, Mr. John Boger, Jr., informs us of a large well near New Franklin, Ohio. It is nine feet by sixteen feet in superficial area, and is sunk to a depth of 140 feet, costing, in construction, $18,000. The well, as will be seen from the above figures, is capable of holding about 150,000 gallons. Our correspondent does not say how full the well is, but that "it has a constant supply of water."

THE FIRE AT CHICAGO.—The area burned over by this almost unparalleled fire, approximates 4 square miles. Ten thousand buildings were destroyed, two thousand of which were business houses. The total loss as gathered from various estimates, cannot be much less than $ 200,000,000. The people rendered homeless by the disaster number probably not less than 100,000.

TEA LEAVES A REMEDY FOR BURNS AND SCALDS.—A poultice of tea-leaves applied to small burns and scalds, afford immediate relief. The leaves are softened with hot water, and, while quite warm, applied upon cotton over the entire burned surface. This application discolors and apparently tans the parts, and removes the acute sensibility and tenderness.

IT is a noble and great thing to cover the blemishes and to excuse the failings of a friend; to draw a curtain before his stains, and to display his perfections; to bury his weaknesses in silence, but to proclaim his virtues upon the ho usetop.

CEMENT FOR STOVES.—Wood ashes and salt, equal proportion in bulk of each; reduce to a soft paste with cold water, and fill cracks when the range or stove is cool. The cement will soon become hard.

JUSTICE consists in doing no injury to men; decency, in giving them no offense.

OUR own heart, and not other men's opinions, forms our true honor.

AN honest death is better than a dishonest life.

Don't Begin to Build in Autumn.

The *Technologist* for October has the following on "Building in Autumn:" There are several strong objections against beginning to erect a building with the intention of finishing it next season, or even completing the edifice before cold weather. Masons have often persuaded their employers to dig the cellar and then let them carry up the foundation walls late in autumn, so as to be ready very early the next season to erect the superstructure. Every intelligent mason knows that the practice is not a good one. Yet, as masons are always crowded with foundation work in the former part of the season,—which is the proper time to do such work,—if they can induce an employer to commence the foundation of a building in the fall, the masons will gain the benefit of a paying job, and frequently two jobs, as a cellar wall erected just before cold weather will often be so seriously damaged by bearing and settling that a portion—perhaps all of it—will have to be relaid the next season.

When a foundation wall is built with mortar filled in the interstices,—which is the only correct way to prepare a foundation for any building,—the mortar near the middle of the wall will not become really consolidated during a period of six months, if the weather be favorable. But, if a new wall is exposed to cold weather only a few weeks after it has been built, the green mortar at the middle will be frozen before it is dry, which will damage the wall by bursting the layers of stone or brick asunder, and by destroying the solidifying principle of the lime or cement. After green mortar has been frozen and thawed two or three times, there will be no more strength in a wall than if the stones and bricks had been laid in a mortar made of ashes, sand, and clay.

In most instances, the earth beneath a foundation wall will be frozen more or less, which will destroy its compactness to such an extent that the wall will settle unevenly, often cracking from top to bottom before the superstructure is erected. Besides this, the bank of earth outside of the wall will expand by freezing—especially where it is not of a dry and gravelly character—so that the whole wall will be thrust inward so far beyond a perpendicular position that most of it will have to be taken down and rebuilt. Cellar walls are frequently thrust inward by the frost, even when a heavy superstructure rests on them. It is sometimes as important to exclude frost from a cellar, to prevent freezing the earth outside of the walls, as to keep vegetables from being frozen. The disadvantages of shorter days also, and more stormy weather than we are liable to have in the former part of the season, must be encountered when one commences to build in autumn rather than in the spring. If the foundation wall is built early in the season with good mortar, the entire structure will have ample time to solidify before cold weather, so that it will resist all ordinary thrusts of the earth during the freezing process. When one commences in the latter part of the season, there will usually be more or less unavoidable hindrances when building almost any sort of edifice. Hence, if a builder commences early in the former part of the season, he will be able to meet hindrances without much, if any, real damage.

It is always objectionable to allow the foundation walls to stand any considerable time without the superstructure. The most complete preparation should be made before the ground is broken. All the lumber should be delivered and stuck up under shelter, so that it may have a long time to dry and become seasoned before it is worked. Then, as soon as the frost is really out of the ground in the spring, dig the cellar, carry up the foundation wall, erect and enclose the superstructure as soon as practicable, let it stand to season, settle, and shrink until autumn; then plaster and finish the inside before cold weather.

By building a dwelling in this manner, all the shrinkage and cracking of the woodwork and the cracking of the walls will be avoided; and the walls will be far more firm than if the plastering had been done in hot weather, when the mortar will dry too rapidly to make a strong wall. Building architectural structures, like the formation of character, is a job of a lifetime. In building a cottage or a palace, a hennery, piggery, or a spacious farm barn, a beginner should avail himself of the practical experience of such builders as have purchased their wisdom at the costly rate of damaging and expensive mistakes in beginning to build in the latter part of the season.

Balloon Ascension.

We find the following account of an ascension in July last, by Mr. John Wise, at Chambersburg, Pa., in the *Franklin Journal:*

At three P.M. a thunder gust was approaching us from the northwest, and, with a view of entering it, the balloon was cast loose at twenty minutes past three. The ascent was moderately rapid, and upon gaining an elevation of a thousand feet, it was discernible that the storm cloud was passing us too far to the east, leaving the balloon outside of its drawing-in influence. It was a mushroom shaped nimbus, bulged out above and below, trailing its lower ragged edge somewhat behind, and it seemed to labor between contending forces, as it swayed and halted in its onward march. The only great difference manifested now between former experiences and the present one, was the very low temperature of the air we were in. Looking upwards, I saw, at a considerably greater elevation, an isolated grayish colored cloud, of an oblong shape, occupying a space of about a thousand acres (I say a thousand acres, because its shadow covered a dozen or more of farms below, and this outline gave me an approximate idea of its dimensions), and it seemed to be quiescent.

My attention was now wholly directed to this, to me, new kind of meteor. The cold increased as we mounted up, and much faster than is usual in rising with a balloon. When yet at least a thousand feet below its apparent concave surface and ragged circumference, we entered a fine drizzling shower of snow, which became more copious as we rose towards the cloud, until we reached the point of the most visible deposition, which was equal to a regular snow fall; and as we rose from this point, it seemed to diminish in quantity, until we reached the lower surface of the cloud, where it ceased, but we could still see the snow falling below us. While it was at a freezing temperature below, as soon as we had fairly become involved in the cloud, the air began to grow warmer. In the cloud it was not nearly so dark and dingy as in a thunder cloud, but the light was of a greenish tint. When we emerged from the top of the cloud, the heat, or rather the increase of heat, was sudden, and the sun, shining on our necks and hands, produced an effect I can only compare to the contact of an acid spray, producing a burning sensation.

The cloud just mentioned showed no bubbling up upon its surface, as is the case over a thunder cloud, and whatever may have been the action taking place within it, it was of a most placid character. On suffering the balloon to drop down through it, we again encountered the snow, less in quantity, but the cold sudden and intense, and immediately both of us became hoarse, with a painful, irritating sensation in the windpipe, indicating a corrosive action there. May this be the action of ozone upon moist animal membranes? I have great reason to believe that such is the explanation of the fact, as it seemed to me that the mere change of temperature could not produce that marked effect. I may mention, in this connection, that I have frequently experienced the same sensation upon entering a storm cloud.

Lismann's Machine for Rolling Metals.

Mr. Abraham Lismann, of Munich, Germany, has invented a machine for rolling metal, which has for its object to effect the processes of thinning and drawing out plates of metal, which have heretofore been carried out by hand. These operations, which occur principally in coppersmiths' work, are now effected by hand, as follows: For thinning and drawing out the edges of circular plates, the latter are hammered in consecutive rows, commencing at the inner circumference of the part to be thinned, and extending in a tangential direction to the outer circumference of the plate. For thinning and drawing out the edges of square or polygonal plates, they are in like manner hammered in consecutive rows, extending from the inner portions of the plate in a slanting or angular direction toward the outer edges. For working the metal into dished or spherical forms, the plate is hammered in consecutive rings, extending from the center of the plate toward the outer edge, such blows being effected by a hammer head with a spherical or convex surface upon an anvil having a concave surface.

According to Mr. Lismann's invention, these operations are performed by rolls, having helical or screw like surfaces, so formed that, when revolved, they will act upon the metal in a series of consecutive cycloidal or tangential lines, extending, like the hammer blows, in oblique directions from the inner toward the outer edges of the parts of the metal plate to be operated upon. These helical surfaces are formed either convex, concave, or plane, as the nature of the work may require. Thus, for thinning and subsequently working up the edges of a circular plate into the form of a rim, a pair of rollers, having helical or screw like working surfaces, are placed upon the overhanging ends of two shafts, carried on suitable bearing in headstocks or framing, and adjustable toward each other by adjusting screws, hydraulic presses, or other means. The plate to be acted upon is, at its center, held by a stirrup frame, rendered adjustable to and from the rollers by being carried by a slide rest, which may be made to assume any desired angular position relative to the axes of the rolls.

The rim of the plate being introduced between the helical rolls, and rotary motion being imparted to the latter, they are caused to act upon the plate in a series of cycloidal or tangential lines extending from the inside of the plate to the outer circumference, as before described, the plate being, at the same time, caused by this action to revolve upon its center, where it is held by the stirrup frame.

The helical surfaces of the rollers may either be formed upon both rolls or one only; the other having a plane surface. Such plane roll may be made of less diameter than the other if circumstances should require it. The rolls may further, more be formed either with only one helical surface, extending right round the roll, or, if the nature of the work requires that the pitch of the helical surface shall be greater than is attainable by one such surface only, two or more helical surfaces of greater pitch may be formed on the rolls.

The rolls may be formed with projecting rims overlapping each other, so as to act as circular shears for shearing off any superfluous length of the rim of the plate after it has been drawn out and turned up, as described.

For working a metal plate so as to convert it into a dished spherical form, only one helical roll is employed, the other being replaced by a spherical surface carried by a suitable hinged frame. The helical roller is, in this case, formed with a number of separate short helical concave surfaces, with spaces between them, so that, as the joint action of this roller and the spherical roll has to take place in concentric rings upon the plate, the plate may be shifted for this purpose when, by the revolution of the helical roll, one of its spaces comes underneath the spherical roll.

THE intellect is superior to the physical system. While the world lasts, the sun will gild the mountain tops before it shines upon the plain.

The Pianoforte.

The improvement, on the old spinet, clavichord, and harpsichord, which gives the title of "PianoForte" to the instrument, was the invention of Bartolomeo Christofali, and was produced very early in the eighteenth century. The name was given to it in the year 1717, by Christopher Schröter, who observed that it could be played *forte* or *piano*. John Harris, in 1730, informed the English public that he had patented "a new invented harpsichord upon which (having only two sets of strings) may be performed either one or two unisons, or two unisons and one octave together; or the fortes and pianos, or loud and soft, and the contrary may be executed as quick as thought, and also double basses, by touching single keys."

We find the following in the *British Trade Journal*: "The first piano known to have been in England was brought from Germany in 1757, and ten years afterwards, in 1767, one was advertised at Covent Garden Theater as a new instrument. The earliest patent granted in England relating to this subject was taken out by Stodart, 1777, and the next by Broadwood, in 1783. After this, the number of patents became very numerous. The earliest entry of the sale of a piano on Messrs. Broadwood's books is 1771; of a grand piano, 1781. At that time the harpsichord (which was practically a harp played on by slips of wood called jacks) was being rapidly driven out of fashion by the piano, and the newer instrument, at first not very popular, was the only one made. The first patent of an upright piano was granted to W. Stodart, in 1795, and in 1807, Southwell made it less unwieldy, and gave it the name of "cabinet," which it has since kept. From 1831 to 1851, Messrs. Collard sold about 32,000 pianos, Messrs. Broadwood 45,863. In 1853, pianos were produced in England at the rate of 1,500 a week.

Music of Rolling Sand.

At the late meeting of the British Association for the Advancement of Science, Captain H. S. Palmer contributed an interesting paper on "An Acoustic Phenomenon at Jebel Nagus, in the Peninsula of Mount Sinai." Jebel Nagus is a peculiar sand slope, from which loud and mysterious noises are frequently heard to proceed, exciting the superstitions of the Bedouin and the wonder of travelers. The slope is about 200 feet in hight, and almost triangular in shape, eighty yards wide at its base, and narrowing towards the top, where it runs off into three or four small gulleys. Sandstone cliffs abound on either side, and, above the head of the slope, cliffs rise for about 150 or 200 feet more to the summit of the mountain. The sand, which is of a pale yellowish brown color, appears to be that of the neighboring desert, derived in the first place from the waste of the sandstone rocks, and then conveyed to its position on the hillside by the drifting action of high winds. Its grains are large, and consist entirely of quartz. The neighboring rock *in situ* is a soft, friable sandstone of a light brown, sometimes nearly white, color inside, and weathering to a dull brown on the outside.

The sand of the slope is so pure and fine, and in, its usual condition, so perfectly dry, and lies at so high an angle (nearly 30°) with the horizon, as to be set in motion by the slightest cause. When any considerable quantity is thus in motion, rolling slowly down the slope like some viscous fluid, then is heard the singular acoustic phenomenon—from which the mountain derives its name—at first a deep, swelling, vibratory moan, rising gradually to a dull roar, loud enough when at its hight to be almost startling, and then as gradually dying away till the sand ceases to roll. Captain Palmer said that this sound is difficult to describe exactly; it is not metallic, not like the sound of a bell, nor yet like that of a nagus. Perhaps the very hoarsest note of an Æolian harp, or the sound, produced by rubbing the wet rim of a deep toned finger glass, most closely resembles it, save that there is less music in the sound of this rolling sand. It may also be likened to the noise produced by air rushing into the mouth of an empty metal flask or bottle; sometimes it almost approaches the roar of thunder, and sometimes it resembles the deeper notes of a violoncello or the hum of a humming top.

Tricks of Jugglers.

Our sober Christian neighbors of the New York *Observer* are responsible for the following: We think Hermann and Heller are jugglers, but what can they do to compare with the Chinese tricksters? A traveler at Kinsai was entertained by the Viceroy, the Amir Kustai, and this was one of the amusements:

"That same night a juggler appeared, who was one of the great Kaan's slaves, and the Amir said to him, "Come and and show us some of your wonders!" Upon this he took a wooden ball with seven holes in it, through which long thongs were passed and, laying hold of one of these, slung it into the air. It went so high that we lost sight of it altogether. (It was the hottest season of the year, and we were outside in the middle of the palace court). There now remained only a short end of a thong in the conjurer's hand, and he desired one of the boys who assisted him to lay hold of it and mount. He did so, climbing by the thong, and we lost sight of him. The conjurer then called to him three times, but, getting no answer, he snatched up a knife, as if in a great rage, laid hold of the thong, and disappeared in his turn! By and by he threw down one of the boy's hands, then a foot, then the other hand and the other foot, then the trunk, and, last of all, the head! Lastly, he came down himself, puffing and blowing, and with his clothes all bloody, kissed the ground before the Amir, and said something to him in Chinese. The Amir gave some order in reply, and our friend then took the lad's limbs, laid them together in their places, and gave a kick, when, presto! there was the boy, who got up and stood before us! All this astonished me beyond measure."

Typhoid Fever Successfully Treated with Milk.

Alexander Yule, M. D., communicates, to the *Medical Times and Gazette*, the following paper:

There is nothing new about the treatment of this fever by milk. As such treatment may not, however, be the general one adopted, I have been induced to offer my testimony as to its efficacy. It stands to reason that people, suffering from disease, quite as much require food as those in health, and much more so in certain diseases where there is rapid waste of the system. Frequently all ordinary food in certain diseases is rejected by the stomach, is loathed by the patient. Nature, ever beneficent, has furnished a food that in all diseases is beneficial—in some directly curative. Such a food is milk. In the twenty-six cases we have treated of typhoid fever, its great value was apparent.

To be sure our number is not large, yet sometimes the small indicates the resultant on a large scale. The indications we followed were—1. To check diarrhœa; 2. To nourish the body; 3. To cool the same.

With regard to the diarrhœa in typhoid fever, we believe it ought, if possible, to be checked, or at least restrained; for you might as well think of leaving a sore-throat in scarlatina to take its course (being eliminative of fever poison), or irritate it a little, as of encouraging diarrhœa in typhoid fever. Astringents were used in all cases (with occasional doses of ipecacuanha), diluted sulphuric acid being found the most serviceable. The acid was used from beginning to end of the fever. We imagine that, in those cases which recover where diarrhœa is encouraged, the patient got well in spite of the treatment; for we believe that nothing so much tends to extending of ulceration, to hæmorrhage, peritonitis, and protracted convalescence as the use of salines or such like remedies. Who would think of healing an ulcer by irritating it by not allowing rest, for the reparative powers of Nature to do their work? An ulcer in the ileum requires rest quite as much as one in the leg.

When diarrhœa became violent, the most powerful astringents were used, and, when the bowels were once "locked up," they were so maintained for from ten to fourteen days, with not only no inconvenience, but with decided advantage. To cool the body and to nourish it were the other two indications:

1. AS TO NOURISHMENT.—That the body in fever wastes rapidly is evident; and from the accumulation of waste material in the blood, and the want of pabulum to feed the fever, the most disastrous results eventuate—resulting in death—from the fever drying up the very issues of life. Now, if pabulum can be afforded to repair the textures that, from the action in the fever poison, are being used up, one great, if not the greatest, object of treatment is attained; for fevers obey, like every thing else in this world, certain fixed laws. Like an object in vegetable life, there is the seed, the bud, the unfolding, the full leaf, the withering away and decadence—so with fevers and their incubation, ingravescence, etc. Now, if the body can be sustained until the fever has gone its course, health will result. Milk, of all things, seems best adapted for this purpose; for it is digestible, is relished by fever patients, contains all the requisite material for the nourishment of the entire body—the nervous system in especial, which in fever is always greatly affected. Furthermore, in fever there is great thirst, and patients ardently long for that which will cool the parched mouth. Thus, by interdicting the use of water *in toto* throughout the fever, nourishment can always be given in the shape of cold new milk. Cold beef tea is by no means to be despised, but is much less relished, and not unfrequently loathed when the fever is intense, while milk is then taken with much gusto. Again, cold milk, when the diarrhœa is severe, exercises a most kindly action upon the ileac ulcerations. The rule we adopted was to allow milk *ad libitum*. In some cases quantities, far beyond what could be absorbed by a stomach whose powers of absorption were reduced to a minimum, were taken, a portion of the milk passing in an undigested state from the bowels. This, however, far from, in my mind, being an objection, was a decided boon, for the milk, as it passed over the inflamed and ulcerated ileum, exercised a soothing influence.

2. TO COOL THE BODY.—Now, cold milk is an admirable agent for cooling the body (cold water would do as well, but then new milk nourishes and cools at the same time), and heat is a prominent symptom of fever (*ferveo*, I boil), and a measure of the activity of the fever changes in the body. Another agent used in all these cases was the diluetd sulphuric acid, which aided in reducing temperature, in restraining diarrhœa, and, if the theory is to be credited, diminishing the alkalinity of the blood.

CONCLUDING GENERAL REMARKS.—Such were the measures relied upon in the treatment of twenty-six cases of typhoid fever. Six of the cases were adults over twenty-two years of age, ten between nine and twenty-two, the remainder being under these ages. Wine was given in no case during the active continuance of fever, as it increased the diarrhœa (when tried), and promoted delirium. When the fever had left, and the patient became exhausted and sleepless, then wine in three cases did well. Never more than six ounces was required *per diem*, and that only for a few days (in an adult). In two cases where there was great pain in ileum, blisters applied there did good. A few doses of tartar emetic and tincture of opium were used in one case to procure sleep, which it sufficed to do. We believe that milk nourishes in fever, promotes sleep, wards off delirium, soothes the intestines, and, in fine, is the *sine quâ non* in typhoid fever.

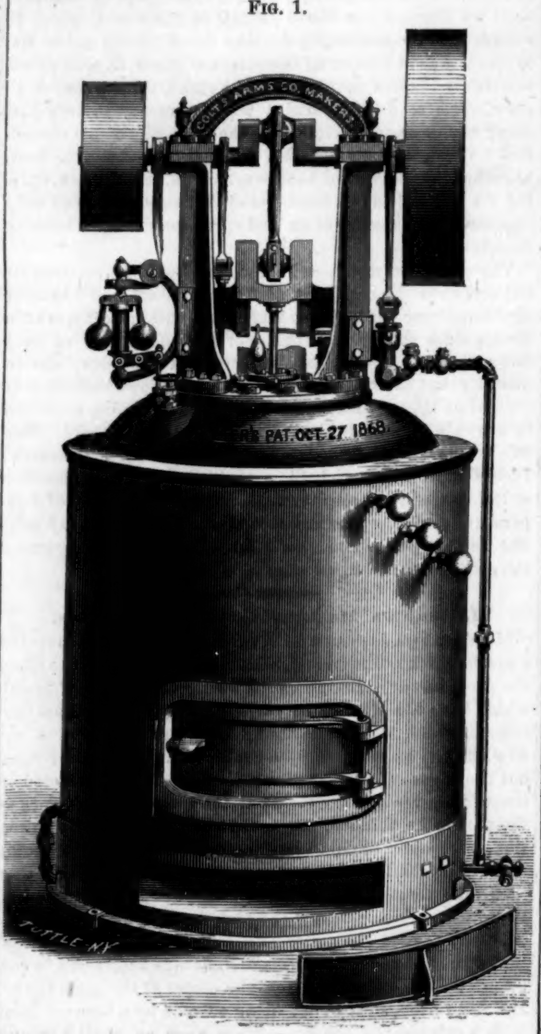
THOUGH a taste of pleasure may quicken the relish of life, an unrestrained indulgence leads to the inevitable destruction.

EVERY man's life lies within the present; for the past is spent and done with, and the future is uncertain.

BAXTER'S PORTABLE STEAM ENGINE.

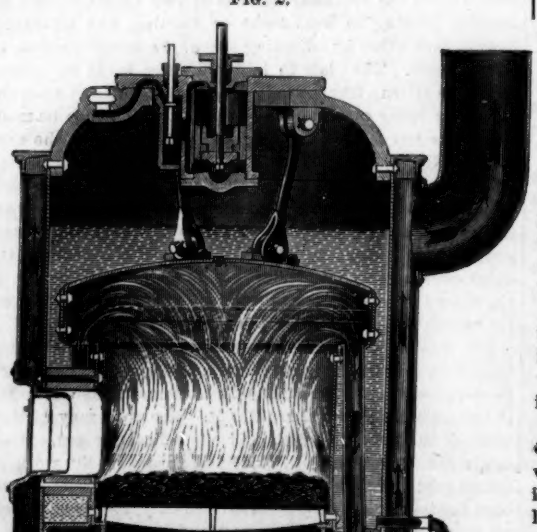
Very few inventions in modern steam engineering have so rapidly won their way into public favor as has this engine, since its first introduction to the public in an illustrated descriptive article published on page 353, Vol. XX. of the SCIENTIFIC AMERICAN.

FIG. 1.



But though as there described, it had sufficient merit to at once command wide attention, the short time which has elapsed since that notice has developed important improvements, not only in the construction of the engine itself, but in the method of its manufacture, the improvements being, as well as the original design, the result of long experience in steam engineering, which has enabled the inventor to combine, in a very efficient manner, the settled and well understood scientific principles of steam as a motive power, in an engine which, while it is free from novel complications likely to perplex the inexperienced, is still such as commends itself to the minds of experts.

FIG. 2.



A very compact, simple, and economical engine, one that could be taken down, transported, and set up with the utmost ease, and which, within a very small compass, should furnish from two to ten horse power, easily attended and run by those who know little of steam engineering, safe from explosion, and not increasing the risk of fire in small manufactories, printing offices, farm buildings, etc., was the aim of the inventor. The success attained in each of these particulars will be set forth in the description which follows.

We shall first notice the changes in construction made in the engine since our former article, referring to the engravings annexed, respectively a perspective view of the engine, a section, and a ground plan of boiler and furnace.

Foremost among these is the provision of a water bottom which serves a four-fold purpose. It prevents all danger of fire to the floor upon which the engine is placed. It furnishes a water heater, which utilizes the heat radiated downward, the water being forced into it on one side by the pump, and passing out, through a short pipe on the opposite side, to enter the lowest part of the boiler. It acts as an efficient mud drum, the slow passage of the water through it allowing the floating impurities to settle and be blown off as occasion may require. Lastly, it forms a substantial and ornamental pedestal for the boiler and engine, easily fastened down, and interfering in no way with the convenience of transportation.

The novel governor illustrated and described in our former article above referred to, in which the resistance of oil in a cylinder (the oil being forced through a small port from one side to the other of a plunger) was made to give a variable cut off, was found too complicated for common use, and has been replaced by one of the ordinary kind.

The pump, formerly placed between the uprights supporting the crank shaft, is now placed on the outside of these supports, so that now, to take down or set up the engine as it leaves the factory, the expanded head of the cylinder, to which all the upper working parts are attached, and to which the cylinder and steam chest are also attached, is released from the boiler by taking off the nuts from the bolts which hold it, and, with the parts attached, is packed for shipment, the valve being properly set, and all properly adjusted for work when it arrives at its destination.

A fire plug of lead is placed in the central and highest point of the crown sheet, which, should the water be allowed to fall so low as to endanger this sheet, will melt and allow steam to escape and extinguish the fire.

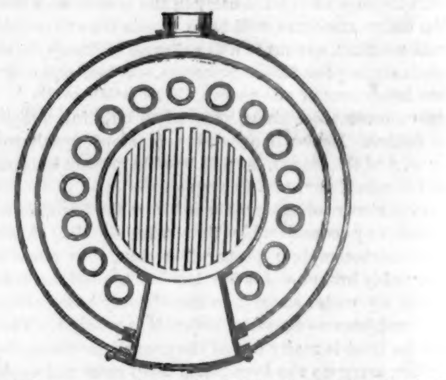
In the engine as first built there was no special steam chest, the steam entering the cylinder directly from the steam space in the boiler. As at present constructed, a steam chest is provided, shown in Fig. 2, which obviates all danger of water entering the cylinder.

The horse power of these engines is tested by dynamometer, with a pressure of 60 pounds in the boiler, and their power is rated accordingly. But though designed to run with 60 pounds, the boilers are tested by hydrostatic pressure to 180 pounds.

The tubes are easily cleaned by a scraper attached to a piece of wire rope, or any stiff brush attached to an elastic handle passed into the tubes from the furnace.

The one and two horse power boilers are made without tubes, but are cleaned in the same way as those with tubes.

FIG. 3.



These engines are made by the Colt's Arms Co., Hartford, Conn. Special tools are employed for all parts of the work, so that when it is desired to replace anything it can be ordered by number, and will be sure to fit.

It is now claimed that the economical production of power by these engines is unequalled by any in market, and any expert engineer, who examines them, must admit that the avenues of waste are closed almost as nearly as possible in the present state of engineering science. The steam is used expansively, in a cylinder jacketed by live steam, and the full theoretical economy of the expansion is thus secured. The exhaust is used in the smoke stack to assist the draft, and a very perfect combustion is thus maintained.

We are told that these engines are allowed in buildings, by the underwriters, without any increase of premium, they being regarded as safe as common coal stoves.

A very large number of them have been sold and are now in use, giving general satisfaction.

The features of the engine are covered by patents dated Oct. 27, 1868; April 13, 1869, and June 28, 1870. The engine was awarded a first premium at each of the Fairs of the American Institute, held in 1869 and 1870, and is or has been exhibited at all large fairs held during the present year.

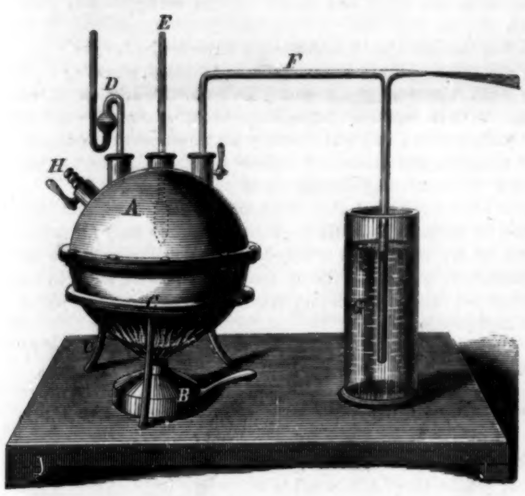
For further information the Baxter Steam Engine Company. 18 Park Place, New York, may be addressed.

Stick to the Fence.

The *National Car Builder* is responsible for the following: For fifteen years daily, at Stamford, Ct., a man has sat on the fence and watched every railroad train as it passed. He is probably trying to make up his mind if it would be safe to ride in the cars. Old fellow, you stick to that fence! If the top rail is sharp, turn it over or put a cushion on it. Fit up a smoking department on the next panel, if you like, and rig a luxurious couch on the next one to that. Bring out your baggage, take a check for it, and hang it on a post. Buy a ticket, and punch it yourself. Ask yourself the distance to the next station, and get insulted. Secure, as your means will permit, all the luxuries of railroad travel, but don't get off that fence to enjoy them. So shall you die a natural death, and the good wife shall not expend the farm in fighting the life insurance companies over your coldcorpse.

APPARATUS FOR EXHIBITING THE PROPERTIES OF VAPORS.

M. J. Benevides, a physician of repute at Lisbon, Portugal, has recently aided the teaching of physical science by inventing an apparatus for the purpose of demonstrating the chief characteristics of steam. This new arrangement consists of a hollow copper sphere, A, with nozzles in four places. In one nozzle is screwed a mercury manometer, D, graduated to ten atmospheres. To another nozzle is screwed the thermometer, E, with centigrade scale to 200°. In a third, there is a glass Giffard's injector, F. The fourth nozzle can be put in connection, by means of a tube of lead or india rubber, with the air, or with a force or air pump. The third and fourth nozzles are furnished with cocks. The sphere is placed on an iron trivet, C, and heated by means of a spirit lamp or a Bunsen's gas burner, B.



The following are the principal demonstrations which can be made with M. Benevides' apparatus:

1, Of the laws of ebullition. Absorption of latent heat. If water be put into the sphere, the cock of the fourth nozzle opened, and heat applied, the water boils, vapor is disengaged, and spreads in the atmosphere. The thermometer is observed to indicate 100° Cent., and the manometer marks vapor of the tension of one atmosphere.

2. Influence of pressure on the temperature of ebullition. If the fourth nozzle be connected with a force pump, and air be forced into the sphere, it will be observed that the boiling only takes place when the temperature or the tension of the steam equals the pressure exercised on the liquid; if, on the contrary, a vacuum be created in the sphere by means of an air pump, it will be seen that the water boils at a temperature, lower to the same degree as the air is rarefied.

3. Condensation of vapor. Development of latent heat. If the fourth nozzle be connected, by means of a lead pipe, with a glass full of cold water, and heat be applied, and the cock opened, the vapor, coming in contact with the cold water, is condensed, and its force is transformed into latent heat, which warms the water in the glass, of which the temperature will soon rise to 100° Cent.

4. Variation of the tension of vapors with the heat. On closing the cock of the fourth nozzle, after having caused the water in the sphere to boil, it will be observed that the thermometer and manometer indicate higher degrees, showing pressure corresponding with the temperature of the vapor. In an ordinary apparatus of this pattern, the pressure can be raised to five atmospheres; for higher pressures, a stronger copper sphere is necessary.

5. Action of vapor on the Giffard injector. The vapor being at a high tension, the cock of the third nozzle is opened. The vapor can be observed to pass through the injector, drawing water up the tube, and throwing it out by the opening.

6. Cold produced by the condensation of vapor of high tension. If the water be heated till the steam has a tension of five atmospheres, and the cock of the fourth nozzle opened, a jet of vapor is thrown into the air. On putting the hand into the vapor, at a distance from the nozzle, a sensation of cool freshness is felt.

7. Employment of vapor as a motor. The fourth nozzle can be connected with a model steam engine, and, on raising the tension to three or four atmospheres, if the cock be opened, the vapor will be observed to give motion to the engine; the heat is transformed into specific work.

So far as the action of the Giffard injector is claimed to be shown by the apparatus, we feel bound to say that the device of M. Benevides does not appear to us to explain the, to most minds, paradoxical action of that instrument. There is a wide difference between allowing the steam jet to escape into the open air, and first condensing it and then throwing it back into the boiler from which it issues, with an additional supply of water. Had the glass tube, which represents the injector on the apparatus, as shown, been brought around to and inserted into the copper sphere, the analogy would have been more perfect; but it then would have required some essential modifications before it would satisfactorily have shown the action of the injector of Giffard.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections during the month of August, 1871.

There were 716 visits of inspection made during the month, by which 1,418 boilers were examined—1,285 externally, and 358 internally,—while 127 were tested by hydraulic pressure. The number of defects in all discovered was 684, of which 121 were regarded as dangerous. These defects in detail were as follows:

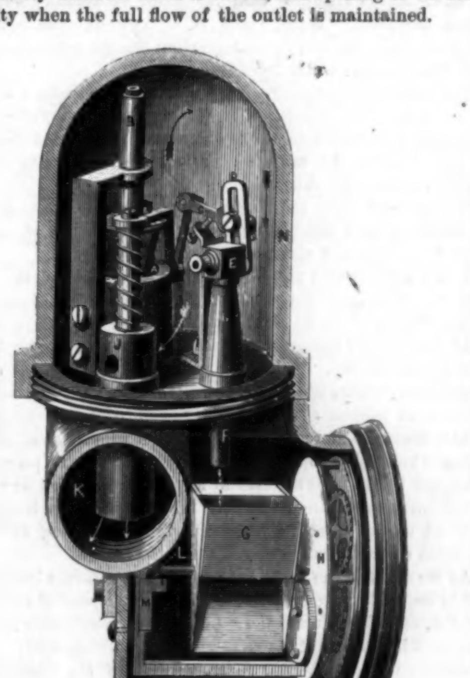
Furnaces out of shape, 47—2 dangerous; fractures in all, 42—17 dangerous; burned plates, 31—4 dangerous; blistered plates, 90—9 dangerous; cases of sediment and deposit, 132—13 dangerous; incrustation, 79—3 dangerous; external corrosion, 62—11 dangerous; internal corrosion, 49—13 dangerous; internal grooving, 35—6 dangerous; water gages out of order, 45—10 dangerous; blow out apparatus out of order, 25—1 dangerous; safety valves overloaded and out of order, 32—7 dangerous; pressure gages out of order, 88—13 dangerous, varying from — 22 to + 15; boilers without gages, 2—2 dangerous; cases of deficiency of water, 6—2 dangerous; broken braces and stays, 15—3 dangerous; boilers condemned, 13—2 dangerous.

We feel compelled to call attention again to the condition of steam gages. It will be seen in the above record, that those out of order varied from — 22 to +15. These are large variations, and when we consider how implicitly many engineers rely upon the steam gages, it is all important that they be known to be correct. We have known steam gages, that have been in use for years, to be relied on with as much confidence as when first put to use; and we have no doubt that many boilers in the country today are being used at excessive pressures simply because the steam gages are out of order, and indicate incorrectly. Steam gages are important attachments, and should receive all necessary attention. No engine or machine is expected to run for years without care and examination; and a boiler attachment so important as a steam gage should be examined frequently, that the engineer be not misled, relative to the pressure of steam carried, by incorrect indications of the steam gage. There were 10 serious explosions during the month, by which 27 persons were killed and 20 injured.

THE WATERBURY WATER METER.

The Waterbury Water Meter, manufactured by the Plume and Atwood Manufacturing Company, of Waterbury, Conn., is shown in the accompanying engraving. It received a short notice in our notes on the Fair of the American Institute in a recent issue, and our readers will now doubtless take interest in examining the details of its construction, as shown in an illustration. It claims superiority, over anything of the kind hitherto produced, on the grounds of durability, simplicity, and accuracy. It is subject to no wear of parts while measuring water, except such as occurs in the registering portion of the device.

A represents a circular orifice surrounding a cone valve, B, which is shown raised, as when measuring water, allowing enough to pass to keep the meter full and supply the outlet, J. It is evident that this valve will open more or less according to the demand made upon the water service, closing entirely when no water is drawn, and opening to its full capacity when the full flow of the outlet is maintained.



The cone or puppet valve, B, is connected by a series of levers, C and D, to a spindle valve in the post, E, which allows a proportionate amount of water to pass through the pipe, F. The meter is thus one of the proportional or differential class.

The water flowing through the pipe, F, is measured by a bucket wheel, G, the measurement being indicated, for the quantity passing through the valve, B, and outlet, J, by the register, H, the latter being a train of wheelwork with a dial, similar to that used on gas meters. The amount of this drip which is thus allowed to waste in operating the register, is about one ounce to every sixty-two and a half pounds delivered, that is, to one cubic foot.

Each bucket, when it has received its prescribed weight of water, gives place to its successor, and in so doing transmits motion to the register train. The intermittent motion of the bucket wheel is accomplished by a triangular piece of metal on its shaft, one of the sides of which rests upon the glass shelf, M.

The direction of flow through the cylinder or body of the meter, N, is indicated in the engraving by arrows. The patentee of this meter is Mr. J. P. Smith, of Buffalo, N. Y. The patent bears date July 12, 1870. For further information, address Plume & Atwood Manufacturing Company, Waterbury, Conn.

M'GEE'S COLLAR PIN.

Our engraving illustrates a very neat, tasty, and convenient device for adjusting neckties to gentlemen's collars, the improvement being in the peculiar construction of a collar pin which attaches the necktie firmly to the collar stud or button, and which is adapted to any style of collar, the tabs or ribbon which constitute the tie being also of any fashion or pattern to suit the taste of the wearer.

Obverse sides of the pin are shown, Fig. 1 representing the appearance of the pin as attached to the button, the style of the face plate of the pin, however, not being limited to the design shown, any form consistent with good taste being admissible.

Fig. 2 shows the peculiarities of the construction. A is a bent spring, which, when the pin is adjusted, is slipped over the shank of the stud or button, and embraces it firmly. To the spring, A, is attached, by soldering or otherwise, the spring plate, B, formed, as shown, of flat or round wire, which, when the pin is worn, passes under the fold of the collar, as shown by the dotted outline in Fig. 2. This spring prevents upward and lateral movement.

The tabs or rubber are attached to a loop, C, Fig. 2, in the manner there indicated, or in any other way appropriate to the fashion of the tie. The pin, with its attached tie, are very easily adjusted, and form together a very tasty design.

Patented through the Scientific American Patent Agency, July 18, 1871, by J. McGee, whom address for further information at Lancaster, N. H.

A Novel Railroad.

A novel tramway or railroad has been lately built in Turkey, by an English engineer, the propelling power of which is not steam but animal, horses or mules being employed. A single rail is laid on sleepers, and the carriage has wheels in the center on the same longitudinal line. Through the car runs a balancing pole, the two ends of which, projecting three feet or more, are secured to saddles on the backs of mules. The animals will thus be one at each side of the load instead of in front, as ordinarily. It would be impossible for the cart to turn over, because in order to do so, it would have to force one mule to the ground and lift the other in the air; and, moreover as the floor would only be six inches above the rail, an overtip would be of no account. All the weight in the cart, if evenly distributed, would bear upon the rail, and the animals, having no load on their backs, would be able to exert considerable traction power. The inventor suggests its employment not only for military purposes but also for tramways in large cities; and says that, where space is very valuable, a horse or mule on only one side of the cart would be sufficient. In towns, on bridges, and other important places, the rail might, for a short distance, be dispensed with; and the passenger vehicles should be fitted with a small friction wheel on either side, so that if a horse should fall down, the balance of the carriage would remain undisturbed.—*National Car Builder.*

Change which Flour undergoes in Barrels.

When flour is kept for some time in barrels, it assumes a certain smell, known as the barrel odor. In order to ascertain whether the bread making properties of the meal were deleteriously affected by this modification, the *Journal of Applied Chemistry* states that Professor Poleck has subjected several specimens to a critical examination, and he finds that the flour undergoes a decided change. The pure normal flour contained 11·06 per cent gluten and 1·44 per cent soluble albumen, but, after keeping, the following results were obtained:

	No. 1.	No. 2.	No. 3.	No. 4.
Gluten................	8·37	7·40	7·23	6·54
Albumen...............	2·14	3·90	4·44	6·46

From this table it is manifest that the relations of the constituents were materially affected by storing the flour in barrels. The author found that greater deterioration took place in the interior of the package where the air could not get access to the flour than on the surface and that meal kept in bags was less likely to undergo change.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

The Psychic Force.

To the Editor of the Scientific American:

In a letter which you admitted to your columns on September 30th, I expressed my surprise at the line of argument taken by Dr. Vander Weyde on the above subject; and the eminent scientist, in your last issue, pleads guilty of entire ignorance of the experiments which were made by Professor Crookes and his two co-laborers, and admits that he cannot explain the phenomena in question. Why, then, did he cry "jugglery," and deem that the discussion was ended?

Professor Crookes, the "reporter" whose "credulity" Dr. Vander Weyde speaks of, is a most eminent scientific investigator, and the editor of the *Quarterly Journal of Science*, published in London; and, if he be necessarily insane on some point, no one familiar with the technical literature of the present day will assert that his particular mania is stupidity on points of fact in physical research. In truth, the whole position of the learned doctor is a false one. It is every bit as foolish and as unscientific to cry "jugglery" as it is to cry "spiritualism" whenever a new phenomenon is presented for investigation.

But, if further proof of Dr. Vander Weyde's want of knowledge of the position of this matter were needed, it would be found in the strange way in which he mingles the psychic force theory and spiritualism together. He may apply his reprobation to spiritualism as much as he likes, and few people will object; but the psychic force is another matter altogether, and any destruction of that theory must be sufficient to convince those who, like myself, demand strict scientific proof, and are not in the least inclined to a superstitious belief in the powers of jugglery or of anything else.

To return to the main question, which Dr. Vander Weyde has not yet considered: Is it possible that a power can emanate from a man's will or mind, over and above the mere dynamic force of his muscles? Many of your readers, and probably Dr. Vander Weyde himself, are familiar with instances of men performing feats of muscular power when under great mental excitement, that the strength of their bodies could not possibly account for. Is not this a "psychic" or mental force? And are these questions "unscientific" or "superstitious," when everybody knows that all muscular action emanates from the will, and derives its quantity or intensity from that same will?

I am a mere inquirer after truth, and my name and address matter nothing to the world: but why do scientific men talk of popular ignorance on these subjects, and then answer questions by muttering "jugglery," "superstition," and the like? When the true explanations of many results that now puzzle us are given, we shall find that they are strictly in accordance with natural laws, and are not produced by disembodied souls revisiting the earth, nor by the inventive genius of a charlatan, in whose talents Dr. Vander Weyde seems to have a most credulous faith. B. D.

Jersey City.

Galvanic Experiments.

To the Editor of the Scientific American.

The interesting electrical experiment, described on page 203 of the SCIENTIFIC AMERICAN, reminds me of a series of galvanic experiments of a similar nature, which I made many years ago. As they have never been published, it may be useful to have them recorded in your widely read paper.

The house I occupied in Holland, in 1840, was situated a short distance from a river, to which, at high tide, the salt ocean water had access; but in which, at low tide, the fresh displaced the salt water. When the first mention was made about burying the plates of the galvanic battery in the earth, in order to procure a constant action, I conceived the idea of throwing a copper and a zinc plate into the river, each connected with a proper wire; and having conducted these wires to my house, and connected them with the galvanometer, a constant current was obtained which beautifully fluctuated in intensity, according to the degree of saltness of the water, but never became zero. When the copper plate was immersed in a fresh water well in the rear of the house, while the zinc plate remained in the sea water, so as to have a battery with two liquids and a porous cup (the earth) between, the current was almost as strong as when both plates were immersed in sea water, notwithstanding the plates were now several hundred feet apart; this proved practically, to me, that the earth offers little or no resistance to electric currents, a fact well established since the introduction of the electric telegraph.

The most curious variation of the experiment, however, was when immersing two copper plates of equal size—one in the fresh well water, and the other in the ocean water; at high tide there was a strong current, as the salt water acted on the copper; at low tide there was no current at all, as both plates were in equal circumstances in fresh water. The degree of saltness of the river water was beautifully indicated by the deflection of the galvanometer, going from zero, for fresh water at low tide, to the maximum at high tide: by slow changes in the surface of the plates, however (principally in that exposed to the action of the salt water), the maximums did not correspond every day, as was to be expected.

This experiment gave rise to a series of interesting and instructive investigations on a smaller scale, which I can highly recommend to all who want to become acquainted with the electric action of different liquids on metals, and also of liquids on one another. All that is wanted is a sensitive galvanometer, and some plates of different metals, of an inch high and two inches long, each soldered to a bent piece of thin copper wire, and sunk vertically in the liquids to be tested. The most practical way to insure perfect contact is to dip the ends of the galvanometer wire, in two separate cups with mercury, and to place these in such position, next to the trough containing the liquid, that when immersing the plates, the ends of the wires, soldered to the same, also dip in the mercury cups; in this way, a current is established at once, and if one plate is substituted for another, the difference of galvanic action is at once not only perceived but measured to a certain degree. The change of direction of the current, by changing one plate or the liquid, is also very interesting to observe, while it constitutes the simplest way to find out what acids or solutions may be available with different metals to make new galvanic batteries. So, for instance, I found in this way, now thirty years ago, that a solution of caustic soda or potash could be used between plates of zinc and copper in place of diluted sulphuric acid, while, some ten or fifteen years ago, such a battery came in use among electro-platers.

I am, of course, aware of the more complete experiments, since made in this same direction, by eminent electricians; but as these results are recorded in such a way as to be only available for the scientific, and not for the practical, man, I simply wish, by my remarks, to put our practical mechanics, of a scientific turn of mind, on such a track as they, with their previous training, can explore with much better success than they would find in digging into the transactions of the learned societies found in our libraries, in which many important facts and valuable truths are, as it were, buried out of sight of those who are most interested in their knowledge, by reason of the practical results they could obtain from them. The investigation I recommend is most assuredly a new field to many, and has the great merit of being economical, and thus within reach of all who would rather spend their spare money in experiments than in tobacco or rum.

The only slightly expensive piece of apparatus required in these experiments, is the galvanometer, if it has to be bought; but I will, in a future number, give the manner in which I constructed one, more than forty years ago—a very delicate instrument of this kind, which cost me almost nothing. I have used it ever since, and have it still in my possession. It reminds me of Berzelius, the great Swedish chemist, who states that, having lost the agate pestle of his mortar, he took an agate button from his coat, fixed it to a handle, and found it so convenient that he used nothing else for the rest of his life; and most practical men, no doubt, have found how often an improvised arrangement, made to serve a temporary purpose, is found to fulfill all the requirements of a permanently useful tool.

P. H. VANDER WEYDE, M. D.

New York city.

Changing of Color in Fishes.

To the Editor of the Scientific American:

I have been waiting in vain for some naturalist to reply to the interesting "Query" of S. M. G. (in your issue of July 15th) why two roaches in his aquarium change color three or four times a day, while two others do not.

The details accompanying the story are too meager to be of much use, but, as a cause inevitably precedes an effect, so there must be reason for the phenomenon described, although it may require the critical observation and sagacity of an Agassiz to detect and comprehend it.

It has been observed that fishes and reptiles sometimes suddenly change complexion during periods of amorous excitement, also when alarmed or agitated with rage.

It is a well known fact that many individuals of the animal kingdom have the power of accommodating themselves to the shades of the localities inhabited.

In the higher orders of animal life, this metamorphosis takes place slowly. Animals and birds, indigenous to the frigid zone, where the surface of the earth is covered with a blanket of almost perpetual snow, are white, probably to enable them to more effectually conceal themselves. Many animals belonging to the temperate zone have the power of changing their coats to suit the season—from dark or variegated hues in summer to white in winter: those living in tropical climates, where perpetual verdure reigns, are gorgeous in color, like the *flora* of the same region.

As we descend the scale, we find the lower forms less capable of defending themselves; and for the purpose of self protection, as well as to aid them in obtaining food, they are endowed with the power to change color more speedily. For instance, the chameleon, many species of the lizard, also many insects, worms, fishes, etc.

It is a disputed question whether the power to change color is voluntary or involuntary; whether it is due to deliberate intention of the will (however rudimentary in the lower forms) or to arbitrary material causes over which the subject has no control; in short, whether it is a vestige of the infinite intelligence bestowed upon the humblest creature for its self preservation, or to chemical law, the only "omnipotent god" of the positivist.

I will relate a little incident, and leave it for the disciple of the Positive Philosophy to explain upon his hypothesis.

In indulging in my favorite recreation one day along the meadow bank of a familiar brook, I discovered, lying quietly on the light sandy bottom of a deep hole, a magnificent dark trout among several beautiful fellows of a lighter color.

"Waltonizing" while attempting to capture this "monarch of them all," I remembered a tributary half a mile away, flowing from a large cold spring, and winding its devious way through black and mucky soil, deep among tangled roots, underneath fallen logs and overhanging alder bushes, from which I had before taken "comrades wearing the same livery." I said to myself, "Aha! here is a stranger; this fellow is a new comer from the spring brook."

Those of lighter hue rose eagerly at the fly, and two or three of fair proportions were soon laid at my feet in the cool green grass; while those remaining, with the single exception of my "colored friend," grew shy and excited, and upon tempting them with a worm, they suddenly departed to divers secret hiding places.

The dark trout alone remained behind, and manifested, as indeed he had done all along, a remarkable indifference to what was going on. At last the bait was carried near his nose, when suddenly, as if agreeably surprised, he was all alert, his red fins quivered, he moved nervously from side to side with curious indecision, he made several short, sharp advances with open mouth in different directions, then quieted down as if disappointed. He seemed eager, yet acted very strangely. At last, with the hook fairly touching his nose, he struck quick and sharp, but the struggle was soon over.

Upon landing him, I found to my surprise both eyes gone. He was totally blind; the wounds had healed, showing that the mutilation was not recent He had evidently wandered from the dark recesses of the little brook above, down into the main stream, and was entirely unconscious of surrounding changes, and therefore, unlike his companions, *saw* no reason for exercising his powers of adaptation.

But I have spun out this yarn too long already, and conclude by saying, this little incident furnishes food for reflection; to my mind it is a very beautiful and conclusive demonstration of the dominant power of the will, even in its lowest and most rudimentary manifestations, over the physical organization.

"There is a natural body and there is a spiritual body," etc. A. R. M.

Facts about Butter.---How it is made at the East.

To the Editor of the Scientific American:

Our English word, butter, is derived from the Latin *butrum;* while this Latin word is of exceedingly doubtful origin, but has most probably come from the Greek language.

It is not known positively whether butter was ever made previous to the Christian era, but, in our translation of the Bible, the word "butter" frequently appears. In Genesis chap. XVIII., verse 8, we read: "And he took butter and the calf which he had dressed, and set it before them," etc. And in Deuteronomy, chap. XXXII. verse 14, the phrase "butter of kine" is made use of. Also, in the Book of Proverbs, chap. XXV, verse 33, we read: "Surely the churning of milk bringeth forth butter." The word appears also in other passages. But in all these cases, the word refers to something of a fluid nature, and whenever the word "butter" appears in the Bible it should read, according to most biblical critics, "thick milk" or "cream." The original Hebrew words *meetz heleb* (translated churning) signify to squeeze or press, and therefore the latter quotation above should read, "the pressing of the milker bringeth forth milk," and this agrees better with what follows in the same passage, "and the wringing of the nose bringeth forth blood."

It is not until about the birth of Christ—probably before—that we have any definite mention of butter, as we understand the word. But it appears that at this time, and indeed for several centuries thereafter, that it was only used instead of oil, as an ointment or as a medicine. The ancient Burgundians were accustomed to besmear their hair with butter, and the ancient Christians of Egypt burned butter in their lamps at their altars instead of oil, a practice also accredited to the Abyssinians. Butter used to be allowed to be burned instead of oil in the Catholic churches during Christmas time, and this accounts for the name "butter tower" which we find at Rouen, in Nôtre Dame, and elsewhere. "In A.D. 1500, George d'Amboise, Archbishop of Rouen, finding the oil foul in his diocese during Lent, permitted the use of butter in the lamps, on condition that each person should pay six deniers for the indulgence, with which sum this tower was erected."

It is a very difficult matter to find out among what nation the practice of making butter originated. Some writers affirm that the ancient Scythians were acquainted with the art 400 years B.C.; and it appears also that the Ethiopians used the article as early as thirty years B.C., as also did the Indidians (inhabitants of India). Plutarch speaks of a visit, paid by a Lacedemonian lady, to Berenice, the wife of Deiotarus, and says that the one smelled so much of butter and the other of perfume, that neither of them could endure the other. But this must surely have been bad butter. Pliny says that the ancient Germans and Britons (barbarians in his time) made butter and used it as food, and ascribes the invention to these nations. And it is generally believed that the Greeks obtained their knowledge of butter from the Thracians or the Scythians, and the Romans from the Germans.

But whether the ancients knew how to make butter or not, it is quite certain that they did not know how to give it the firmness or consistency of the butter made at the present day. "With them it was poured out like oil; with us it is cut and spread." Their butter, too, must have been very inferior to ours in quality.

We are all well acquainted with our present mode of churning; other nations have some really funny ways of making butter.

In northern Africa, in Egypt, and Arabia, the cream is put into a goat's skin turned inside out, and pressed to and fro like kneading bread. And sometimes they place it on an inclined plane and let it roll to the bottom, and then replace it to run the same course. This method, it is said, produces

butter in a short time. Sometimes the skins are kneaded with the feet, as observed by Dr. Chandler while traveling in Greece.

In Bengal they churn every morning that they may have fresh butter for breakfast. They simply stir the milk rapidly with a stick. In some parts of the East they make butter of the milk of the buffalo; but this is in every way inferior to that made from cow's milk. W. R. S.

Action of Hydrogen on Red Hot Oxide of Iron.

To the Editor of the Scientific American:

In a late number of the SCIENTIFIC AMERICAN, there appeared an article on "Boiler Explosions" over the signature of John Lynch, M.D., Professor in South Carolina University, which makes an erroneous statement of chemical facts.

The writer, in discussing boiler explosions, comes to the conclusion that they are caused by the chemical combination of hydrogen and oxygen gases. His error consists in confounding the action of free hydrogen when in contact with free oxygen, with the action of free hydrogen when in contact with combined oxygen.

I quote a few words for the purpose of explanation: "While the machinery is not in motion, or the steam not escaping freely, the hydrogen fills the upper portion of the boiler, and does not come in contact with the red hot iron or its oxide; but any cause which may produce an expansion or disturbance of the gas, so as to bring it into contact with the oxide of iron, heated to the same temperature as will decompose steam, the gases will immediately become chemically combined, producing a most intense heat ('the most intense heat that can be produced is caused by the combustion of hydrogen gas') and *causing an explosion;* at the same time the "oxide of iron will be reduced to its metallic state." I have italicized the words to which attention is directed. No explosion will take place from the combination of the free hydrogen with the combined oxygen of the oxide of iron, supposing for a moment that such an unheard of state of things, as the contact of free hydrogen with red hot oxide of iron in an ordinary boiler, should exist.

An explosion from the combination of hydrogen and oxygen results only when these mixed free gases are ignited by intense heat. When free dry hydrogen is passed over red hot oxide of iron or copper, there is no free gaseous oxygen to combine with the hydrogen, but oxygen in a solid combined state. This oxygen, the hydrogen abstracts from the iron quietly and without explosion, forming vapor of water, while metallic iron remains behind.

In an ordinary steam boiler no free oxygen can, under any circumstances, be produced from the decomposition of the water or steam, and there is good authority for stating that no free hydrogen can be so produced. Consequently, no explosion can take place from the ignition of the mixed gases.

I agree with the writer that "the engineer should study thoroughly not only machinery but also chemistry, at least so far as it relates to those bodies which he is obliged to use."

But this study should not embrace any erroneous chemical theories unsupported by chemical facts; but should include especially the tensile strength of iron under the varying conditions of thickness and temperature, and the immense power capable of being developed by the generation of steam in a confined space.

The intelligent engineer should not be long in learning the fact (though Heaven save him from the personal experience so necessary in other matters) that, when a boiler explodes, it is because the shell of iron without is not strong enough to withstand the pressure of steam within.

West Farms, N. Y. JOHN F. GESNER.

Testing Boilers by Hydrostatic Pressure.

To the Editor of the Scientific American:

In your paper of September 2d, you published a letter from me in which I questioned the possibility of testing a steam boiler properly in the manner stated in the testimony of Inspector John K. Mathews. In your issue of September 30th, I find an answer, to my communication, signed by that gentleman, in which he explains how, by having a man at the safety valve, men stationed at the blow cocks, and men at the main valves of the engine, with the men, as sworn to, at the hydrant valve, and, I suppose, properly agreed signals, such a feat is possible. For so much of the communication I am thankful; the rest proves nothing except that Mr. Mathews is unable to discuss a simple question without showing his contempt for the witnesses of coroners' inquests (among which are some of the ablest and truest men in the country); no doubt he dislikes the whole institution, and particularly its characteristic prying into people's actions.

"That knaves and fools will exist with the human race" (to use his own words) is evident; and as long as men, innocent of overalls and too large to get through a manhole, take the oath and fee of inspectors, and certify to a thorough inspection of steam boilers, there is no danger of either the one or the other running out.

But, Mr. Editor, the question under consideration is a serious one, for on its decision depend the lives of the people. It is certainly very convenient to fill a boiler by a hydrant; and it would be more so to call this a thorough test. Yet the man must be very selfish and devoid of all regard to the sacred obligation of an oath who would not spend ten minutes to attach a pump and really and truly test the boiler under hydrostatic pressure. I am not willing to admit that men, at all the possible outlets of a boiler, could save the same from strain and injury; for water has no practical elasticity, and even lightning would not be quick enough to save the boiler from overstrain. But there is, fortunately, one security. Boilers, when subjected to hydrostatic pressure, gradually change their form, and assume the one which holds the largest amount of water. A barrel nearly approaching a cylinder will become a perfect one under *maximum* test; all stays are gradually brought to their true tension, and, if one should be too short, it will (being unable to stand the whole pressure of several hundred inches) be torn off; plates not properly cut and caulked will be strained and leak, and the whole boiler will assume the shape, appearance, and duty as though it was under the same pressure of steam, with this exception, that the solid pressure of water on a cold boiler is more severe.

The object of the law is manifest, and is intended to show what the condition of the boiler is under this test. For this purpose it is to be examined carefully outside while under pressure, and inside when the pressure is relieved. That this can be done thoroughly in the manner sworn to as having been done on the *Westfield*, I deny.

Unless Mr. Mathews will add to our information, and condescend to treat correspondents of the SCIENTIFIC AMERICAN as gentlemen, and not as fools and knaves, I cannot further recognize him. JOSEPH A. MILLER.

Boston, Mass.

Treatment of Colorado Ores.

To the Editor of the Scientific American:

I am much pleased to have, by means of my article upon this subject, drawn forth Mr. Church's letter in your issue of October 7th. I do not consider myself competent to judge of the correctness of the position taken by this gentleman; but I am glad to find that, by having the accounts at the mine, in which I am interested, kept in a systematic manner, and by contributing these details to Professor Hague, I have done something toward enabling Mr. Church to prove, as he believes, the correctness of his theory.

For one, however, I hope Mr. Church will not include me among the number of mine owners who have "systematically resisted all efforts to ascertain the truth." For some years I have sought, by having weekly returns of all costs and results, by having assays constantly made of the ores, and by all other means in my power, to ascertain "the truth;" and all facts I have gleaned have, in one way and another, been placed before those interested, with the desire that others might throw still more light upon the subject than I was able to.

Long since I came to the conclusion that concentration was the remedy, but how shall we effectively concentrate? I think the gold ores of Colorado will average not far from thirty dollars per tun. The smelter will pay us a much better proportionate price for an ore worth $150 than one worth $100 per tun. How can we concentrate to a value of $150 per tun? THOS. J. LEE.

Boston, Mass.

Ignition by Superheated Steam.

To the Editor of the Scientific American:

An accident occurred here recently to a Low steam automatic heating arrangement, whereby a valuable building and some lives were placed in great peril. The heating arrangement has attached to it a regulator which admits water to supply the loss by evaporation, connected to the boiler by two pipes, one at the top and one at the bottom. The bottom pipe became closed by rust, preventing the water from entering the boiler, while, at the same time, the glass gage indicated water at the usual hight. The consequence was the boiler became empty, and nearly white hot, creating superheated steam, which set fire to the felting or covering around the pipes. This was discovered just in time to prevent serious damage.

I would suggest that parties having these heaters should have the pipes that lead to the boiler taken off and examined, as that is the only way the evil can be detected; and then place a draw off cock on the same.

Canton, Ohio. G. W. D.

Liquid Measuring Can.

In this invention, an ordinary sheet metal can has a large vertical tube, and a smaller one, placed beside the large one, extending from the bottom or below the bottom to the top. A float in the larger one is intended to rest on the liquid and is partly suspended, by a cord passing up over pulleys, down the side of the can, around a pulley, and back over pulleys and down into a smaller tube to a weight suspended by it. One of the pulleys carries a notched disk, which will be turned the distance between two notches by the falling of the float when a given quantity of fluid is drawn, say a pint, the parts being accurately adjusted therefor. A pawl, resting on the edge of the disk and dropping into the notches as each one comes under it, shows when the given quantity has been drawn. The disk is held always in the right position, when the drawing begins, to be turned forward just one measure between the notches before the pawl drops. A three way cock for drawing from the large measuring tube has a branch leading from the bottom of the can, for allowlowing the liquid to flow into the tube through said cock when the flow from the tube is stopped; but when opened to draw therefrom, the cock is turned against the passage so as to shut off the flow therefrom. The disk may be notched to indicate any measures preferred, and it may be arranged on any approved part of the can. The weight need not necessarily be arranged in a tube, but is so preferred. Mr. Christopher Martin Bridges, of Leon, Iowa, is the inventor of this improvement.

THERE is perhaps no time at which we are disposed to think so highly of a friend as when we find him standing higher than we expected in the esteem of others.

[Special Correspondence of the Scientific American.]

THE CERULEAN PLEASONTON'S SUNSHINE PATENT.

Washington, D. C.

The cerulean Pleasonton (Gen. A. J., of Philadelphia, not the Hon. Boutwell Grant, Ex-Commissioner, nor even a brother) has just been successful in receiving a patent for his blue light vegetable and animal stimulator, fructifier, and panacea. Not an unpleasant entertainment, on the evening of our national extended-eagle anniversary, are those blue lights that shoot upward so zealously, and then suddenly vanish without even a tail to tell their story. The discussion, of the scientific and unscientific features of the blue light process. belongs to some other column of your paper, but you may be pleased to note the breadth of the inventor's views and the modesty of his expectations, as appear in the "breadth" of his original claim, which reads, we are informed, very nearly as follows: "I claim the use of the combined natural light of the sun in combination with the transmitted blue or electric light of the sky, to the growth of the animal kingdom of nature, to the growth of fruits, vines, flowers, plants, vegetables, etc, and to the cure of diseases in men and animals."

The term "combined natural" is good, being both scientific and complimentary to his solar majesty; and the discovery of the new dynamics of the sky in transmitting light deserves of itself a patent, with a seven years' extension thrown in. The examiner, in his treatment of the case, well observes that the applicant cannot properly claim the use of the unchanging forces of nature, and such a monopoly could not be granted. He can only claim new and useful devices for applying and controlling the powers of nature. The patent granted contains two clauses of claims, one for the method of utilizing the solar rays, another for the construction of buildings for the above purpose. The method consists solely, as far as we can discern, in combining the sunlight with the blue light by transmitting the solar rays through alternate portions of clear glass, and blue, purple, or violet colored glass, and the construction of the conservatory consists in making the roof and sides of such alternate portions of glass. What will the scientific men, who for many years have experimented in the most elaborate and thorough manner to ascertain the chemical effects of the constituent colored solar rays on vegetable life, say to this patent? In a published paper read before the Philadelphia Agricultural Society, Mr. Pleasonton says:

"If" (a brief but sensible preface, that word if), "by the combination of sunlight and blue light from the sky, you can mature quadrupeds in twelve months with no greater supply of food than would be used for an immature animal in the same period, you can scarcely conceive of the immeasurable value of this discovery to an agricultural people. You would no longer have to wait five years for the maturity of a colt; and all your animals could be produced in the greatest abundance and variety. In regard to the human family, its influence would be wide spread—you could not only in the temperate regions produce the early maturity of the tropics, but you could invigorate the constitutions of invalids, and develop in the young, a generation, physically and intellectually, which might become a marvel to mankind. Architects would be required to so arrange the introduction of these mixed rays of light into our houses, that the occupants might derive the greatest benefit from their influence. Mankind will then not only be able to live fast, but they can live well and also live long."

Mr. Pleasonton's faith in blue light is such that the address referred to is printed on blue paper, "to relieve," as he says, "the eyes of the reader from the great glare from white paper;" and he expresses the hope of seeing "this colored paper introduced for all books and periodicals.' The effect of blue light on the human brain should be his next theme. ‡

The Approaching Solar Eclipse.

An eclipse of the sun will occur, on the eleventh of next December, which will be visible as total one in India, Ceylon and Australia. Preparations are being made to observe the astronomical event in a manner worthy of its great scientific importance. The British men of science are already commencing energetic action to make the most of the occasion. The Astronomer Royal is superintending the adaptation of instruments already in his possession for use in his chosen locality in India. The President of the Royal Society has arranged to have instruments of the newest and most approved kind sent to Australia. The President of the Scientific Association at the recent meeting stirred up the members to vigorous action in order to gain all possible knowledge from the solar phenomenon. The Royal Society of New South Wales is organizing an expedition to Cape Sidmouth to observe the event, and it is expected that a staff of observers from England, will take possession of a fitting position in Ceylon. Government is to be petitioned for the means, which it will not fail to grant, and much enthusiasm and interest prevail among the British men of science, who are determined to utilize the solar ecclipse to add largely to the knowledge of solar physics. We are sure that our American astronomers, who earned great distinction by their observations during the last two solar eclipses, will not be behind the European co-workers in doing all that can be done to aid the cause.

MILK STATISTICS.—Sixteen quarts of pure milk are required to make one pound of butter, and 10 quarts to make one pound of cheese. When butter is 40 cents per pound, and cheese 11 cents: one pound of butter equals in value 16 quarts of milk and returns $2\frac{1}{2}$ cents per quart to the dairyman. But one pound of cheese from 10 quarts of milk only gives him $1\frac{1}{10}$ cents per quart for the milk.

Improved Railroad Rail Joint, with Nut Locking Chair.

The object of the invention illustrated in the accompanying engraving, is the locking of the nuts of railroad fished joint bolts, by the prolongation inwards and upwards of the lip or lips of the chair, near to or against one or more of the horizontal, inclined, or vertical sides of the nuts, and to furnish also a better combination for a railroad rail joint fastening than has hitherto been used.

The views show the outer or nut side of the joint, and the method of locking the nuts of the bolts, by means of the lip or lips of the chair, and also the form of the chairs. One view is of a joint with a plate chair, with a lip under each nut; the middle portion being turned down upon the crosstie and punched to receive the spikes. The other view is of the joint with a form for a rolled iron chair, with a continuous lip, and a flange, resting upon the tie, punched for the spikes. The two forms of chair, one of plate and the other of rolled iron, are shown separately.

Many other forms of chairs may be made, if desired, of plate, rolled or cast iron, to fit and lock any form of nuts, whether square, hexagonal, octagonal, oval, etc,, in any position in which they may be placed when screwed up.

By prolonging the lip or lips of the chair upwards between the nuts, or under and between them—the chair being spiked down firmly to the crosstie—the chair will hold the rail from "creeping," without slotting the rail, which is desirable for steel rails.

The fish plate on the nut side of the joint is made without a groove, to avoid the use of washers under the nuts. Upon the opposite side the fish plate is channeled to receive the heads of the bolts, and prevent them from turning when the nuts are screwed up.

It is generally conceded that the fished or bolted rail joint is the best joint known, but, unless the bolt nuts are locked securely and permanently, they will work loose, and as the value and safety of the joint depends upon the plates being held firmly against the sides of the rail, the working loose of the nuts destroys, or very much impairs, the bolted joint. With the nuts locked perfectly and permanently, the bolted joint is the best joint known; without it, it is no better than, if at good as, some others.

As the fished joint is weaker than the rail itself, it should have a bearing upon the crosstie or sleeper; for any settling of the joint bends the plates, strains the bolts, and tends to force off or loosen the bolt nuts. The joint should rest in a chair of plate or rolled iron, to prevent the rail ends from being pounded into the sleeper by the wheels passing over them, and to prevent the hammering of the ends of the rails, in consequence of one end settling, under the load, below the level of the other. By locking the nuts by means of the lip of the chair, it is claimed, the joint is rendered perfect with the least number of parts possible,easy ofmanufacture, strong, durable, and cheap.

With the joint on the tie or sleeper, and in the nut locking chair described, the outer pair of bolts, commonly used for bolted joints, are unnecessary. The saving of the cost of these two bolts, and of the extra length of plates required for them, will more than equal the cost of the nut locking chair. It is claimed, therefore, that this joint can be furnished considerably cheaper, while it is much better and more reliable, and will last much longer than the four bolted fish joint now generally used.

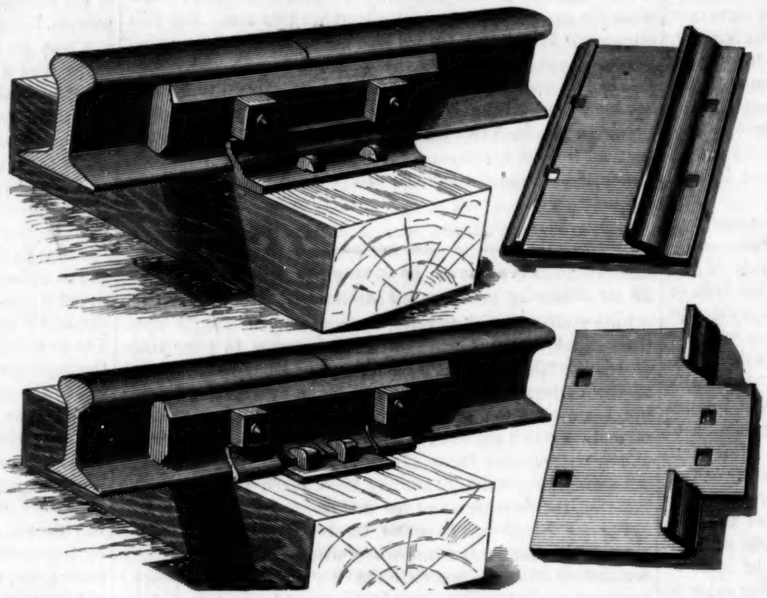
It is claimed that this nut locking chair can be used for four bolted fish joints already laid down, to great advantage, for if the nuts of the two inner bolts are securely locked by means of it, the joint is safe, and there will be but little, if any, strain upon the outer bolt nuts to force them off; in point of fact the rail joint will be equally strong without them.

The use of a two bolt joint and the nut locking chair permits an increase of the section of the fish plates and the size of the bolts, if desired, and thus strengthens the joint, at a cost still considerablcy less than the ordinary four bolt joint.

Several of the best railroads in this country have used the chair with the bolted joint, and one of the very best—the Cleveland and Erie—has used the two bolt joint with a chair; but not with a nut locking chair. This alone, it is claimed, was needed to make the joint perfect, and the advantages to be gained, by so locking the nuts of the fish plate bolts, are manifest. We are informed that some important railways will soon introduce this joint, which has met with the approval of experienced railroad engineers.

The improvement is the subject of two patents, granted to G. W. R. Bayley, of Algiers, La., dated December 29, 1868, and March 2, 1869.

For further information address G. W. R. Bayley, Chief Engineer, New Orleans, Mobile, and Texas Railroad, New Orleans, La.



BAYLEY'S RAILROAD RAIL JOINT, WITH NUT LOCKING CHAIR.

Awful Fate of a Balloonist.

At Paoli, Orange county, Ind., recently, Professor Wilbur made arrangements for a balloon ascension, accompanied by George H. Knapp, editor of the *Orange County Union*. As they were about getting into the balloon, the cord gave way, and they made a spring for the car, but only succeeded in grasping the ropes. As the balloon rose, Mr. Knapp let go, and fell from a hight of about thirty feet without serious injury. Professor Wilbur held on, and attempted to climb into the basket; but was unable to do so and the balloon shot up rapidly with the aeronaut.

At a hight of about one mile, the doomed man let go his hold and came whirling to the earth. At the hight he had attained, he looked like a small sack about a foot long. As he approached the earth he was coming down feet foremost, then spread out horizontally, then doubled up, turned over, and then straightened out with his head downward. As he struck the earth, he fell upon his head and back. His head was crushed into an indistinguishable mass, and his body was bruised and crushedhorribly. The body made a hole in the ground eight inches deep, and it rebounded four feet from where it struck.

To add to the painful character of the accident, the Professor's young wife and little daughter were on the ground and witnessed the terrible affair.

COMBINED SADIRON AND STAND, AND COMBINED REVERSIBLE SADIRON AND POLISHING IRON.

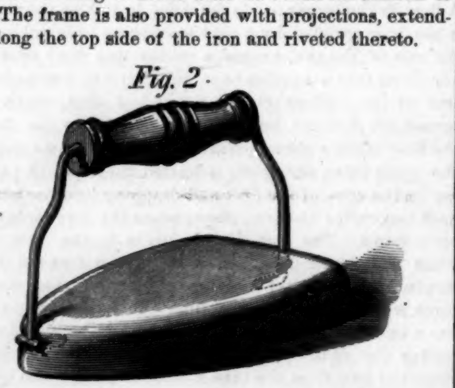
The first named of these new inventions is shown in Fig. 1, and the second in Fig. 2.

In the combined sadiron and stand, the stand is made separately, and riveted to the heel of the sadiron, so that the

Fig.1

iron stands upright when resting on the stand. The stand consists of three legs—two for the heel and one for the handle—connected by two bows of an approximately triangular shaped frame, having brackets extending under the end of the iron, each having a small stud on which the sadiron is seated. The frame is also provided with projections, extending up along the top side of the iron and riveted thereto.

Fig. 2.



The stand is made of malleable iron or any other suitable material, and its attachment adds but a trifling amount to the cost of the iron.

By this manner of attaching the stand to the iron, the former is always with the latter, ready for use. It prevents the smooth face of the iron from being scratched or otherwise injured. The sadiron can be placed on any part of the table, while adjusting the clothes, and will retain its heat longer than when placed on a separate stand, which latter subtracts heat from the iron every time the two are brought into contact.

It is claimed that the attachment of the stand in no way interferes with the ironing, and that it will not, unless greatly overheated, burn the table when placed upon the latter in the manner described, as the supports are so slender in proportion to their length that they radiate off the heat before it is conducted through them to the table.

The combined reversible sad and polishing iron shown in Fig. 2, is very simple and easy to operate. The iron is provided with a spring handle which allows it to be reversed. The flat face is used as an ordinary sadiron, and the rounded face, which is highly polished, as a polishing iron. This form prevents the polished side from becoming injured in heating the iron, as the flat face only is placed upon the stove or heater for this purpose.

Several reversible irons have been invented, but it is claimed that the one herein described is the most simple and the cheapest yet devised, dispensing with all complications, catches, etc.

Patents for the above inventions have been secured in the United States and Europe. Any parties wishing to manufacture the same on royalty can obtain full particulars by addressing Myers Manufacturing Company, 104 John street, New York.

Breeding Silkworms.

The doctrine of survival of the fittest is being enforced by the silk growers of Lombardy, who have adopted the cellular system of MM. Pasteur and Cantoin. Moths and eggs are both subjected to microscopical examination, and only the healthy are used for the purpose of perpetuating the race. This mode of inspection not only confines reproduction to the most vigorous specimens, but it insures the detection of the disease that has recently so virulently attracted the silkworms of northern Italy. Signor Cattaneo, of Milan, states that this disease is caused by the degeneration of the mulberry tree, and it seems that this opinion is well founded, as some trees grown from seed imported by that gentleman, from the north of China—the native land of the mulberry tree—are far more vigorous in growth than the white mulberry tree common in Italy; and their leaves contain much more of the resinous substances which are the nutriment of the worm, and from which the silk is produced. If Signor Cattaneo's view be a correct oneit will be necessary to import seed into Europe to re-invigorate the plantations, which are the chief subsistence of the silk worms. Our silk growers of the West will find it inter- esting as well as profitable to bestow attention on this subject.

Plants in Bedrooms.

Dr. J. H. Hanaford, in *The Household*, says that the idea that plants throw off nitrogen in the night to an extent to prove injurious, in any material degree, may have had its origin in the vagaries and speculations of some medical theorists, utterly forgetful of an over-ruling Providence who makes no blunders of this kind. These plants have their labor to perform, so to speak, and we need not trouble ourselves about that, but simply regard all as right.

While the breathing of every living creature, the combustion of fuel, etc., are constantly destroying the oxygen of the air, leaving an excess of nitrogen, the other element of air, (the two gases, oxygen and nitrogen, making pure air,) some means of restoring these relations would seem necessary. This is done by the vegetable creation, the leaves of plants, like lungs, absorbing this gas, and throwing off the oxygen or restoring the purity of the air.

The animal creation and combustion thus furnish carbon in the form of carbonic acid gas to the vegetable, while the vegetable creation kindly returns to us the oxygen in a gaseous form, and the carbon in a solid, in the form of food; an arrangement with which we need not quarrel. This work is constantly going on, illustrative of the wisdom and the goodness of the Great Father. It is a matter of little importance whether this is in vast creation, on a grand scale, or in our sleeping rooms. It may be remarked that it would be possible to fill our rooms with various articles to an extent to leave too little room for air, and thus deprive ourselves of this necessity of life We can scarcely have too much of it, as it is our life to a greater extent than many suppose. But even if there might be some of the evils referred to, it does not follow that these rooms should be so closed at night as to exclude all of the outward air or prevent the escape of a large amount of carbonic gas, or supposed excess of nitrogen from the plants. The breathing will leave such an excess, even with no plants in the room, which should be allowed to escape.

Such sleepers have more occasion to fear this deadly gas, constantly produced by breathing, than the "night air," so foolishly dreaded.

In short, while our sleeping rooms are so often too small, it may be advisable to have our plants in some other room, with open doors, that they may aid in purifying the air. We may rest assured that they will do us far more good than harm; that this law of compensation is in active operation all around us, and is merely another term for the goodness of the Creator.

TO VIOLIN PLAYERS.—A correspondent, Mr. J. R. Little, of Monmouth, Ill,, suggests the use of chalk on the fingers of the left hand to prevent their slipping on the strings. Chalk will undoubtedly answer this purpose, and may be found useful to performers whose hands are subject to perspiration.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. A. E. BEACH.

☞ "The American News Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents or the German States.

☞ Messrs. Sampson Low, Son & Marston, Crown Building, 185 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXV., NO 17 .. [NEW SERIES.] .. *Twenty-sixth Year.*

NEW YORK, SATURDAY, OCTOBER 21, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

THE GREAT FIRE AT CHICAGO. A NATIONAL CALAMITY AND A TERRIBLE LESSON.

While, from pulpit and press, has issued and is still issuing a flood of lamentation over the great misfortune that has befallen Chicago, and which is not her calamity alone, but a national disaster: and when eloquence and rhetoric have striven to give forcible utterance to the intense sympathy for the sufferers that pervades the civilized world: we can add little, by any words we may pen, to the public realization of the magnitude of the catastrophe, or to the universal generous impulse to extend efficient material aid to the homeless and bereaved; an impulse that has not expended itself in useless talk, but in prompt, noble, and openhanded munificence.

Our sorrow is sweetened by the pride we feel in these generous deeds, which go far towards restoring our faith in humanity, severely tasked by revelations, of fraud and dark doing, lately brought to light in our midst. There must be some good left in the world when such spontaneous and genuine sympathy for suffering is displayed.

Is there no useful lesson taught us in this dreadful catastrophe? The fire record of this country is one which may be profitably reviewed, in connection with this last crowning event, in the dark catalogue which eclipses all that has gone before. New York, Troy, Portland, and Chicago have so far been the cities doomed to feel the fiercest wrath of the fire fiend.

All these great fires occurred under a combination of peculiar circumstances. There had been long drought, and everything combustible was in the proper condition to burn with the fiercest rapidity. There were quarters in each of these cities in which the fire could feed itself fat on wooden structures whose combined burning generated a heat too intense to be withstood by walls of brick or iron. In each case, there was a fierce wind that blew the flames directly upon the heart of the city, and speedily forced the conflagration far beyond human control. In each case, it was seen that so called fireproof structures are not proof against such a combination of circumstances; that walls of stone or brick, with beams and columns of iron, alike succumb to heat of sufficient intensity, and that in structures made of materials that will not of themselves burn, there are usually stored goods that, in the ovenlike heat which warps, crumbles, and cracks fireproof walls, take fire and increase the power of the conflagration to destroy other similar structures.

The wooden sidewalks and pavements which abound in Chicago no doubt did much, in their excessively dry condition, towards spreading and adding fury to the flames; and it is stated that the fire ran along these streets to great distances, interfering with the work of the firemen, and rendering their efforts hopeless.

It is safe to infer from the careful general study of fires in cities, and the consideration of all the circumstances of the four great fires above alluded to, that, were it not for wooden buildings massed together in cities, there never could be such extensive conflagrations. It is in these sections of summer-dried wooden buildings that the fire first gets beyond the means of control. In them it gathers its intense power of destruction, which every new morsel it licks up increases, until finally glutted, or obstructed by a providential change of wind or a heavy fall of rain, it falters in its work of ruin.

The ruin that has befallen Chicago awaits every city within whose bounds masses of wooden buildings stand, whenever a similar combination of circumstances shall arise.

The Brooklyn, Jersey City, Newark, and Paterson papers have been loud in their expressions of sympathy for the destitute of Chicago, and Brooklyn was among the very first to send a large sum of money to the sufferers. Let generous Brooklyn itself beware. It boasts that Chicago alone of all American cities has rivaled it in rapidity of growth. It may be that Chicago alone of all American cities can rival it in ruin. Nearly half the city of Brooklyn, as well as the other cities named, is built of wood. Some time will come the dry season, the fierce gale, blowing toward the heart of the city; and a fire, that under ordinary circumstances would be easily quelled, will spread into wide destruction.

After all these examples of the danger of massing wooden structures, it would seem we should learn wisdom. One third of a prosperous city now lies desolate; and, practically, its entire business, its means of recovering its loss, is destroyed. In this respect, as well as in the extent of area burned over, this fire has been more disastrous than any on record, except the great fire of London. It is no surface injury the city has sustained; she is hurt in her most vital part. She will recover, but for years will feel the effect of this blow. Regret is unavailing. We can only extend the hand of sympathy and assistance, and learn from her fate to avoid the danger that has proved the prime cause of her fall.

Among the many reflections that crowd themselves upon the mind, connected with this event, the evidence of the growing feeling of brotherhood among nations, is one that will not escape the notice of the thoughtful; and the means by which this feeling is nourished, will also be easily recognized. The news that Chicago was burning, reached London and Paris, and the chief European centers, only a little later than it was known in New York; and the telegraph wire that sent the sad news across the Atlantic, flashed back words of sympathy and cheer, and pledges of assistance, which will soon reach its destination. "Pay to the order of"—pulsates along the cable, and a check is drawn in New York for Chicago. Truly, this is like shaking hands across the mighty waters that, fifty years ago, separated two continents by months. Rapid communication has done more to unite the interests of the civilized world than all other influences put together.

The total amount subscribed up to Wednesday night, the 11th inst., was over two and one quarter millions dollars, and probably that amount will be doubled before this paper reaches its readers.

These timely succors, together with the insurance—at least fifty per cent of which will, in all probability, be paid—will do much toward restoring the business of the city, which had, before this trouble, immense vitality.

The wooden buildings, sidewalks, and pavements will be replaced by more substantial structures, and, in time, the Garden City will perhaps be all the stronger for this purification by fire.

AN EXAMPLE TO MANUFACTURERS.

A correspondent writes from Berkshire county, Mass., giving an account of what has been done in the village of Housatonic towards elevating the condition of the workmen in the mills, and rendering their lot as comfortable, refined, and respectable as that of any class of citizens in the community. It is an example worthy of imitation on the part of all manufacturers, and we should hear less about strikes, shut outs, and combinations, if a similar consideration for operatives was everywhere exhibited.

The Owen Paper Company, of Housatonic, has been celebrated for many years. It was one of the pioneers in this branch of industry, and has established an enviable reputation for the superior quality of its manufactures and the honorable dealing of all concerned. It is not, therefore, necessary to speak of the paper made here, or to give a gratuitous advertisement of the products of the factory. Everybody has used the paper, and many years of successful industry is a sufficient public notice; but there is one feature of the mills, entirely disconnected from its business affairs, which is not known to the world at large, but which ought to be, for the good example it affords; and it is of this that our correspondent speaks.

The present owners of the property have purchased all of the land on both sides of the river for several miles, chiefly for the purpose of controlling it and preventing the approach of any element discordant with the general principles they have adopted in their conduct of affairs. The moment the stranger crosses the line of the property, he is conscious of the presence of a presiding authority, as the road is kept in admirable order, the fences are neatly painted, shade trees are judiciously planted, and little parks laid out: and in front of the mills, instead of litter and dirt, boxes, bundles, and confusion, there are neat gravel roads, grassy inclosures, clumps of trees, and such order as one generally only sees about the grounds of a wealthy country gentleman. This at once gives an air of refinement and civilization to the place, and prepares the visitor for the neatness and discipline that reign within the walls.

The process of the manufacture of paper is always an interesting one, but when it can be followed from the rags to the finished "cap," in an establishment kept as neat and orderly as the Housatonic mills, it is not alone the beautiful application of mechanical genius that attracts us, but the practical solution of the question of how a business can be carried on as a pecuniary success, and, at the same time, with a constant regard for the comfort of the workmen. It is a place through which a lady could walk without fear of soiling her dress, even if she wore the unsightly train the sex affects so much under present fashions. The neatness of the place suggests the propriety, on the part of the visitor, of carefully removing all dust from his shoes before entering it. The appearance of the women engaged at work is entirely in keeping with the surroundings. They wear neat calico dresses, and have the air of being quite as refined and respectable as persons engaged in the more fashionable and aristocratic occupations of teachers, governesses, and the like. In fact, the woman question here meets with its proper solution. Women are enabled to support themselves, to lay up money, to carry their share of the burthens quite as respectably and independently as the men.

The company make more money, beyond a doubt, by having in their employ persons of such thorough respectability; and if it costs money to keep the place clean, to plant shade trees, and surround the operatives with refining influences, they more than get their return in the improved character of the work and the emancipation from discontent and strikes.

All of the persons employed in the mills are provided with homes. Comfortable cottages, surrounded by gardens and flowers, dot the hill sides, and adorn the banks of the river. They are all handsomely painted, and vary in size and elegance according to the business responsibility of the occupant. Some of the higher officers occupy what might be called villas—really architecturally beautiful houses, such as any gentleman from the city would like to own as a country seat. For the unmarried women, there is a fine boarding house, with its cupola, piazza, and every modern convenience, conducted under the careful superintendence of a matron. It looks more like a boarding school for young ladies, than a place in which women live who work hard to earn their daily bread. Ample provision is also made for the education of the children. And in order that the religious instruction of the community should not be neglected, the company have built a handsome church, and contribute liberally to the support of the minister. There is a fine circulating library and reading room attached to the mill, absolutely free to all; and the character of the books on the shelves, and the good use made of them, is one of the most interesting features of the place. There are often five hundred volumes out at a time, some of them histories, some novels, some travels, and all capital reading for instruction or amusement. There is a librarian paid by the company, an intelligent woman, who is in attendance from 11 A. M. until 9 P. M., who cheerfully gives any information to her patrons, keeps a record of the books, and takes care of the place. Between 12 and 1 o'clock, the usual time for dinner, after partaking of that meal, clusters of the men and women can be seen entering the reading room, to look over the files of papers; and in the evening, the place, being warmed and well lighted, is often full of persons who come to consult such books and journals as cannot be taken home. Religious papers of all denominations, several of the monthlies, illustrated papers, and the leading scientific journals, are kept on file, and among them the SCIENTIFIC AMERICAN is a great favorite, if marks of frequent handling may be taken as a test. There are no grog shops or nuisances of any kind, and if any of the workmen show a tendency to visit such establishments, they are immediately furnished with a permanent leave of absence—their room is counted much better than their company.

At the time of the French Exposition of 1867, a reward was offered to the owners of the best conducted manufacturing establishment, taking into consideration the care of the workmen, the moral features of education, lodging and general deportment of the men. There were numerous competitors, and we do not recollect who won the prize, but it is evident that the mills now owned by Mr. Cone, at Housatonic, ought to have competed for the honorable distinction.

Much is said, in this country, about the dignity of labor, but most people act as if they had no faith in it. A successful mechanic rarely wants his son to pursue the same calling; he sends him to college, and, after college, to a profession, where he often learns ways that are decidedly unprofessional and unworthy of his father. It is not the labor that dignifies, but the character of the man that makes any honest work respectable; and when manufacturers take this view of the question, and surround their work by refining and elevating influences, so that no one need feel ashamed to be found at his task, they become real benefactors of their race, and are reformers in the right acceptation of the term. There is no dignity in labor, if it be conducted in a low and groveling way. There is nothing more dignified than labor, when carried on with a pure and elevated spirit. The example set among the hills of Berkshire appears to be worthy of study aan dimitatio.

RECENT PROGRESS IN METALLURGY.

At the recent meeting of the Lyceum of Natural History, Professor Egleston, of the School of Mines of Columbia College, made a few extemporaneous remarks on the recent progress of metallurgy in Europe, whence he had just returned. The Professor stated that the Pattinson silver process was now almost entirely abandoned; and in its place had arisen, to great favor and almost universal adoption, the zinc process described in a former number of our journal. The advantages of the zinc process were set forth many years ago by Karsten, but, for some inexplicable reason, pronounced impracticable by the workmen who tried it. It was afterwards rediscovered and patented by Parkes in England, but then found no favor, and fell a dead weight in the repertory of new inventions; finally, in 1858, it again raised its head, and, after many modifications and revolutions, has driven all other methods from the field. The old Pattinson desilverization is now chiefly confined to very poor ores, and

such as contain antimony. What is called mechanical *Pattinage* is used at Stolberg, but the zinc method, employing steam and hand work, is now substituted for all kinds of ores, especially pyritous and blendes.

Another step in advance is the completion of the mechanical preparation works at Clausthal, commenced about eight years since. This immense establishment, more than 1,000 feet in length, is chiefly designed for silver leads, blendes, and the Hartz mountain deposits. It combines all of the latest improvements, and enables the government to economize all of the precious metals of that region, and serves for the education of a useful class of metallurgists.

Similar works have also been constructed at Ems, where the character of the ores is more in the yield of lead than of silver.

In the metallurgy of zinc, there has been a great improvement by the adoption of the regenerating furnace. At the extensive zinc works in Belgium, there is one furnace which runs 160 muffles, and the gas regenerating furnace has nearly everywhere superseded all other forms. In lower Silesia, they work ores of zinc which do not contain more than nine to ten per cent.

The economical use of iron slags has been pushed so far that Professor Egleston made the startling announcement that there are a good many furnaces on the Continent which actually sold their slags. The slags are either run directly into iron wagons or into water for granulation. They are worked up into cement and artificial building stones, are employed in chemical processes, especially the manufacture of alum, and are used to make crown glass where lime is required; and, in general, waste cinders are fast becoming a thing of the past.

The progress in steel manufacture has been very great, especially in the size of the pieces cast, and in mechanical contrivances for handling and working them. Twenty-five tun hammers are not uncommon. At Krupp's renowned establishment he was received with the utmost courtesy and shown everything. The great secret of the efficiency of these works is in the military discipline which prevails. The different gangs of men are marched up, deployed, and manœuvred precisely like companies and regiments of soldiers; and there is no haste and no confusion, so that any number of crucibles of melted steel can be brought and poured out without any company coming in contact with another.

Krupp now proposes to construct a hundred tun hammer. By a new contrivance of reversing the rollers, heavy steam carriages are superseded, and the armor plates or rails go back and forth.

The ideas in reference to the construction of blast furnaces are much modified. They now build them without the massive outer coating, and sometimes exclusively of fire bricks, and much more open and accessible below.

In general, according to Professor Egleston, the progress of metallurgy in Europe has been very great within a few years, and he promised to present the chief points, for the information of the Society, during the course of the winter.

MASTER AND APPRENTICE.

The relation of masters to their apprentices may form a theme upon which a few hints may be profitably thrown out, although unfortunately, as we think, for the industrial interests of the country, these relations have changed very materially during the last fifty years. The old system of binding boys to a term of service, for which their reward should be largely in instruction imparted to them, has given way, in good measure, to the method of paying stipulated money reward for very limited terms of service, instructing the youths so employed only in some few details of a trade, and then getting as much as possible out of them for the money paid.

The result of this is that the proportion of really skilled workmen, when considered with reference to the aggregate number engaged in mechanical avocations, has greatly diminished; while many who are called machinists, bootmakers, or carpenters, are really only competent to run a lathe, to peg on a sole, or to shingle or clapboard a building.

There are, however, some shops which adhere more or less to the old apprentice system; and, whether they do or not, there still remain certain duties which masters owe to the youths employed by them, which, we fear, are often too much neglected.

While the full parental power of control, and the father's right to exact obedience, are, under the modern system of limited service, perhaps not to be considered as vested in employers, the duty to watch, with some care, the habits of boys, and to counsel and admonish them when likely to go wrong, is a duty devolving upon every master, and one which he ought not to shirk.

It is his duty, also, to judiciously praise and encourage all that he sees commendable, in their habits or handiwork, thus cultivating their self respect, and that regard for the opinions of others which forms in youth one of the most powerful stimulants to well doing, and one of the strongest safeguards to morals.

It is his duty to reprove when reproof is deserved, and to set such an example to others that his reproof will deserve and command respect. But his reproof should be so tempered with kindness, and an earnest desire for the good of the one reproved, that evil passions shall not be roused into violent opposition. It is his duty to instruct, not only in the elements of the calling upon which his apprentices are entering, but upon all matters of life experience, upon which his age and knowledge of the world have rendered him wiser than his young assistants.

How many masters throughout this great country are performing these obvious duties with fidelity? How many of them can point to this or that young man who is going to the bad, and say, "My conscience is guiltless of neglect toward him?"

The dictates of common humanity, not to say Christianity, should prompt every master to watch, counsel, admonish, reprove and instruct, as seems necessary for the good of the young minds and hearts over which he has some measure of authority. The man who refuses or neglects to do this is neither humane nor Christian.

FAIR OF THE AMERICAN INSTITUTE.

ELECTRICITY.

Electricity, in one form or another, plays a prominent part at the exhibition this year.

RHUMKORFF'S INDUCTION COIL.

This wonderful instrument is exhibited by the Stevens Institute of Hoboken. Its length is 40 inches, hight 18½ inches, and it weighs 166½ pounds. The primary wire is 200 feet long, while the secondary wire is 234,100 feet, or about 44⅓ miles. The battery employed to charge it consists of three glass jars, 10 inches diameter and 12 inches high, into which are lowered, by a windlass, fifteen plates of zinc and fifteen of carbon, each 6×9 inches. The exciting liquid is the usual mixture of bichromate of potash and sulphuric acid. With the above battery freshly charged and immersed 1 inch, the coil freely gives sparks 21 inches long in air, and white Leyden jar sparks 14 inches long; and the spark can be made to penetrate glass 3 inches thick. This performance has never been exceeded by an induction coil, and it is satisfactory to know that it was constructed by our countryman, Mr. E. S. Ritchie, of Boston. A few years since, the coil belonging to Columbia College, also made by Mr. Ritchie, was carried to Paris by Professor McCullough, and shown to Rhumkorff, who was so much astonished at its superiority over anything that he had ever constructed, that he begged permission to dissect it. This permission was granted, and he found that Ritchie's insulation and manner of winding the wires was superior to his own, and he adopted the American form.

It is generally admitted by physicists that Ritchie's contributions to our coils have been of great value, and that he has built several instruments superior to any of European manufacture. The performances of the monster coil are highly suggestive of a severe thunder storm, especially when the Leyden jar is filled and discharged in rapid succession. The effect of these discharges is to fill the air with the odor of ozone, and it is a question whether the instrument could not be used, as a convenient generator of this form of oxygen, on a sufficiently large scale to be employed as a bleaching agent in the arts.

BURGLAR ALARM.

There is the usual ringing of bells and perpetual din made by the opening and shutting of doors, to which the wires are attached, while the efficacy of this system of security against unwelcome visitors is set forth by the inventor or his agent. The plan of having the bells continue to ring until the connection is broken by some one in the house, is a capital one; and, if a bell on the street could be rung at the same time to attract the notice of the police, the rogues would be apt to vacate such premises, as being too uncomfortable for quiet work.

ELECTRO-PROPULSION MOTOR.

This is the name given to an invention for working sewing machines by magnetism. To the end of a long lever are attached two iron armatures, and, by an ingenious pole changer, the magnetic force is made to operate first on one side and then on the other; and, as the lever oscillates, it turns the crank of the wheel which is to do the work. The inventor uses four large cells of a Bunsen bichromate and carbon battery, to charge the magnets. The novelty of the adaptation consists in the manner of applying the pole changer, in the cup shape of the armature, and perhaps in the peculiar form of lever.

The circular which was handed to us, says: "This apparatus can be applied for propelling sewing machines, as now on exhibition; also other machinery and street cars—as any power desired can be obtained by *magnates*." There is considerable truth in the latter part of the claim, as the magnates of our city can testify; as to the power of magnets to propel "street cars and other machinery," there appears to be some difficulty, as it has never been successfully accomplished. There is a small locomotive, driven by magnetism in another part of the building, but this moves in such a weak timid way, as to suggest a break down the moment a load is attached to it.

Of the Electro-Propulsion Motor, the circular further says: "It dispenses with the use of the feet, which, in the opinion of the medical faculty is so injurious." We agree with the medical faculty that it is injurious to dispense with the use of the feet, and are decidedly in favor of plenty of exercise. If it is true "that the apparatus can be *prefixed* to any kind of machine," we are likely to see much of it. It will be necessary, however, for the inventor to employ a more economical and convenient form of battery, before he can expect to induce many private individuals to try the new motor.

PHOTOGRAPHS OF MAGNETIC FORCE.

A beautiful application of photography, to the illustration of physical phenomena, is shown by Professor Mayer, of the Stevens Institute, who exhibits plates of the diagrams, formed by magnetic force, very much resembling the sound pictures, so long familiar to the students of philosophy.

Professor Rood made photographs of the electric spark in a manner somewhat similar to this, an account of which was published in Silliman's *Journal*.

Putting electricity and magnetism on paper is one of the best ways in which to study these phenomena, and is a feature in modern research.

ELECTRICITY APPLIED TO MEDICINE.

The number of pieces of apparatus for the use of the medical practitioner, shown in the Fair, is unusually large, and indicates greater attention to this branch of therapeutics than formerly. Some of the contrivances would be highly prized by teachers in our schools, if they were better known, and could be had of dealers in philosophical instruments. We have to note particularly cauterizing instruments, an improvement on Stoehrer's induction apparatus, a universal platina zinc battery (which would be an admirable thing for professors of physics, if they knew about it), and a battery for galvano-caustic, exhibited by Curt W. Meyer; to this list, must be added the electro-medical generator of Professor Steele, and the portable machines of the Galvano-Faradic Company. The electromagnetic machine of the latter company is highly commended by some of the best physicians in New York, and, from the cursory examination we were able to make of it, we are disposed to cordially unite in calling attention to its efficiency, convenience, ingenious adaptation to a variety of uses, portability, endurance, and simplicity. While it is specially constructed for the use of the medical profession, it has many points to command the attention of all persons who may have occasion to employ induced currents for any purpose whatsoever.

GALVANIC FLUID.

There are so many fluids that can be employed in galvanic batteries, that it is difficult to see how any one of them can be patented; and, after they are patented, we should suppose that most persons would prefer to know what they were using, rather than to blindly follow a prescription. This reminds us that we found one exhibitor who bought his bichromate of potash, at a high price, already in solution, under the head of a "yellow liquid," without knowing what it was. We suggested a saving of fifty per cent, by using the dry salt and Croton water.

OTHER APPLICATIONS.

We do not refer to the telegraph, as that has become an old story. Nickel plating, which a short time since, was uncertain, now comes out brighter and more durable than silver. Aluminum plating is yet to come, but can hardly rival the pure white of nickel. Galvanoplastic is represented in a few groups, and indirectly in ornamental decorations of machinery. It would have been instructive to the public to have had the whole process of electrotype deposit illustrated and explained.

Electric clocks, with self feeding battery, and bank alarms, were on exhibition, and there may have been other pieces, of apparatus in which electricity played a part, which escaped our notice. We should have been glad to see a good thermo-electric pile, a cheap ozone generator, a large Ladd's magneto-electric machine, a meteorograph, alarm thermometers, electric pianos, engraving by electricity, electric car brake, Caselli's telegraph for sending autograph messages, electric lights, electric safety lamps, and a suite of galvanic batteries, such as we have seen at exhibitions in other countries. Much more has been done in the line of the application of electricity to the arts than is commonly supposed, and it would be of great use to the community could all of the contrivances be collected into one exhibition for comparison and study.

BULKLEY'S PYROMETER.

In our recent notice of this invention, we gave the address of Mr. H. W. Bulkley as 10 Barclay street; it should have been 98 Liberty street, New York city.

A REMARKABLE HISTORY---A TRUE STORY THAT IS STRANGER THAN ROMANCE--HOW MISFORTUNE WAS CROWNED BY SUCCESS.

In 1858, Mr. Thomas Sheehan, now as well as then of Dunkirk, New York, foreman in the blacksmith department of the Erie Railway shops at that place, patented, through the SCIENTIFIC AMERICAN PATENT AGENCY, a submarine grapple, which, though an ingenious invention, proved to be one for which there was little demand.

This was his first invention; and the cost of its completion, together with one year's struggle to manufacture and introduce it, completely exhausted Mr. Sheehan's means, and reduced him to the extremest poverty. Now Mr. Sheehan, though not fortunate in inventing, making, and selling submarine grapples, had, in conjunction with his good spouse, been eminently successful in increasing his family, which comprised eight children at the close of the year of struggle above mentioned.

Eight children, and an empty larder, are rather stern facts when a father is called upon to meet them; and in this case our inventor's troubles were increased by the not unnatural complaints of his wife, who accused him of having left a good situation to pursue a chimera, thus reducing his family to pauperism. In fact, the good woman was decidedly bitter, and her acerbity, added to the really desperate condition of Mr. Sheehan's finances, produced in him a mental state under which some men would have permanently gone to the bad.

Not so our inventor. He kept a stiff upper lip, and sought long and anxiously to provide support for the hungry mouths that appealed to him for food.

It did not subtract from the trouble of this critical period in Mr. Sheehan's life, to discover that his failure had been due, in great measure, to the derelictions of a partner whom he had taken in with him to aid in conducting the grapple business, and who he found had taken undue advantage of his position, selling wares for which no returns were ever made to the firm, and otherwise misconducting himself.

Just at this crisis, Mr. S. D. Colwell, an old friend of Mr. Sheehan, and General Freight Agent of the Erie Railway at Dunkirk, chanced to meet our inventor in the streets of that thriving town, and accosted him, with

"Well, Thomas, how are the grapples? I hear they have used you up."

"Yes," was the answer, "the grapples have done my business; I wish I had never seen them."

"Throw 'em away," advised Mr. Colwell. "Have you any now finished?"

"I have one almost done," said Thomas.

"Finish that; I will pay you forty dollars for it, and have it used for picking up coal at the dock. The money will help you in your present emergency, and you can go back to your old place in the shop and earn a good living for your family."

"I will," said Thomas.

Back to his humble home, went our inventor with new hope in his breast, and set himself to finish the grapple with all due speed. But, alas, upon what slender threads do the fortunes of men hang! A tap, the only one our inventor had of the size required, suddenly snapped asunder, and, as it was essential to the progress of the work, he must have a new one or he could not go on.

In this strait, he applied to his wife to lend him twenty-five cents to buy the necessary steel to forge the tap. But she, having no faith in the grapple, refused, for the two very good reasons—first, that she believed the money would be thrown away if she gave it to her husband; and second, that she had not the money to give him, even if so disposed. The refusal was seasoned with some very hot word-spice that made it very unpalatable to Thomas. But he bethought him of a merchant, who, in brighter days, had seen the color of his money, and who, perhaps, would now give him credit for the small modicum of steel he required for the tap.

To this merchant he hied, and, somewhat reluctant to prefer his request, began beating about the bush; and, finally straying into politics, hot words passed between them, and our friend, feeling his manliness would suffer too keenly by asking credit for the steel, came away without it.

With no definite purpose he went home, pondering upon how he should surmount this, now no trifling, obstacle of the broken tap.

He found his wife making ley for soft soap, but her acidity in no way neutralized by the alkaline reaction. Despondent and discouraged, he sat down, in no very enviable mood, when he chanced to spy a piece of iron lying near the tubs at which his spouse was working. Meditating upon how he could make that piece of iron hard enough for a tap, he was led to a rather rude experiment, the results of which have in the end made him a richer man than he ever dreamed of being.

It so happened that from a distant relative, a Roman Catholic priest in Ireland, our friend had inherited quite a library of works on chemistry; some of them rare and valuable. He had read some of these books to very good purpose. "There is surely carbon in that ley," thought he. "If I only could get that into this iron in the proper proportion, I should have steel, and from that my tap, and so finish my grapple."

With little hope or faith that he should succeed, he took some of the ley, and adding, without any particular reason for so doing, some saltpeter and common salt, made a paste with this solution and a hard grudged saucerful of the little remaining flour there was in the house. He then forged the tap, and, enveloping it in the paste, put the whole into a luted iron box and exposed it to heat for two hours in a blacksmith's fire. To his joy and surprise, when he took it out, it was hard enough to cut cast steel. The grapple was finished, and forty dollars flowed into the family treasury of Thomas Sheehan. He went back to his old work, disgusted with patents, and resolved never to have anything to do with one again. But the remembrance of the tap, hardened in so unique a manner, still haunted him. Having a great deal of case hardening to do, he thought one day he would repeat the experiment upon a large scale, which he did with perfect success.

For twelve months he went on to experiment, purchasing the materials with his own money, and working in secret by night, and at odd hours. At the end of twelve months, he reconsidered his sentence of condemnation on patents, and applied for one on his process, which was granted September 4, 1860, the claim being for a combination of damaged flour, potash ley, or ley from hard wood ashes, niter, common salt, and sulphate of zinc, for case hardening iron.

In 1867, he patented an improvement on the above named process, the improvement being the substitution of water impregnated with carbonic acid for the ley of potash or wood ashes.

In 1868, he took out another patent for an entirely new process, which consists in the use of raw limestone, charcoal, black oxide of manganese, sal soda, common salt, and pulverized rosin, combined, for converting iron into steel, which is now widely used, and from which he has reaped quite a fortune.

No less than twenty-three of the leading railways in America now use this process, under license from the patentee, for hardening the links, guides, pins, and nuts of locomotives, effecting, we are told, no less a saving than from five to six hundred dollars annually on each locomotive, in obviating the lost motion consequent upon the wear of links, guides, and pins.

The inventor has already received, for licenses under his patent of 1868, $29,650, and has just sold the remainder of his patent in America for $45,000. If on the day he broke his tap, in his cottage in Dunkirk, it had lasted till he finished his job, or if he had then had twenty-five cents, he would, in all probability, today have been a poor mechanic, working at his forge in the Erie Railway shops, and a process of national importance, in its effects upon the great railway system of the country, might never have been given to the world.

Never, perhaps, has the old adage, "Necessity is the mother of invention," received a more apt illustration, and never was the occasional value of an untoward accident more signally demonstrated.

MARQUARD'S ARTIFICIAL STONE.

If we watch the great amount of labor required to shape the rude stone, as it comes from the quarry, to the ornamental forms required for embellishing our modern architectural structures, we need not wonder that, long since, attempts have been made to produce these elaborate forms by molding. For interior work the plaster of Paris has been the successful substitute for ornamental stone, chiefly for statuary; its pure whiteness, nearly imperceptible shrinkage, and the ease with which it is cast in forms, have secured for it the lasting favor of all. However it has grave defects; it is very opaque, of a dead white color, and lacks the semi-translucency of statuary marble, which causes this to be so far superior for all productions of high art; but its great defect is that it is too soft and cannot stand the weather at all; water dissolving it slowly, any product of plaster is ultimately destroyed by the rain. Therefore many attempts have been made to produce artificial stones having the advantages of plaster without the disadvantages just mentioned.

The *terra cotta* is nothing but a fine brick clay, requiring burning after being molded; but as in the burning it shrinks and changes its shape, it is unfit for fine work; also its color, which is either like brick or of a dirty brown or gray, is objectionable.

More successful have been those who experimented in another character, making use of the properties of the soluble silex, to combine with alumina, magnesia, lime, etc.; but here is a delicate distinction to be made, as the use of one or another of these ingredients, in different proportions, gives widely different results.

Among all the artificial stones which have recently fallen under our attention, we noticed in particular a compound, the result of experiments made by Philip Marquard, of 468 Swan street, Buffalo, N. Y., which, at first sight, struck us by its pure whiteness, semi-translucency (like marble), and the ease with which it appears to have been molded, evident from the ornamental shape of the samples sent us; by further investigation, we found it to take polish like marble, and to stand the severest weather, as water does not penetrate it in the least. Chemically, it is silicate of lime, with an excess of the latter; it also contains some alumina.

The inventor states that it is far cheaper than any natural stone worked by hand; and does not shrink in burning, coming out of the fire exactly equal in size and form as it came from the mold. All that is wanted to introduce this invention is a partner with some capital; and we do not doubt that, taking in account the excellence of the article, this will not be a difficult matter for the inventor and patentee to obtain.

SCIENTIFIC INTELLIGENCE.

SIMPLE TEST FOR ARSENIC, ANTIMONY, AND PHOSPHORUS.

The solution of the substance to be examined is first considerably diluted with water, and poured into a wide mouthed bottle, to the cork of which are fastened a number of pieces of parchment paper, previously saturated in acetate of lead, nitrate of silver, and sulphate of copper. A few drops of sulphuric acid are now added, some pieces of zinc thrown in, and the cork put on. In case any gases are liberated, they will react upon the strips of paper, and the color will disclose to what particular element the reaction is due. Phosphuretted hydrogen does not blacken nitrate of silver and acetate of lead, but does act upon sulphate of copper. Antimonetted and arsenetted hydrogen do not affect the nitrate of silver and sulphate of copper, but blacken the lead salt. Sulphuretted hydrogen, however, blackens all three of the above metallic solutions. In order to decide what elements are present, the strips of paper are to be macerated in a solution of cyanide of potassium. If the coloration immediately disappears, it was due to sulphuretted hydrogen: if it slowly changes in cold and more rapidly in heat, it was caused by phosphorus or antimony; if it only bleaches a little and turns brown, and does not disappear when heated, it may be traced to arsenic. For ordinary purposes and rapidity of work, this method appears to be sufficiently accurate and will enable the operator to dispense with the more cumbersome Marsh apparatus.

THE COLORING MATTER OF SMOKY QUARTZ.

In August, 1868, the largest deposit of deep black quartz crystals was discovered, in the canton of Uri, that had hitherto been found. Some of the larger ones weighed respectively 267 pounds, 255 pounds, 210 pounds, 134 pounds, and 125 pounds; and the total weight of the crystals found in the cave was 33,000 pounds. The finest specimens of the collection were purchased for the Cabinet of Berne; and, on their arrival, the cause of the dark color of the crystals was made the subject of lively discussion at the meeting of the Bernese Academy. In order to solve the difficulty, Professor Forster undertook an exhaustive and elaborate study of the whole question. His paper, covering twenty-two octavo pages has just been published in a supplementary number of Poggendorff's *Annalen*; and, without going into the details of his method of research, we give below the results at which he has arrived.

1. The coloring matter of smoky quartz is disposed in more or less regular figures, which display the hexagonal structure of the crystals.
2. The specific gravity of the black quartz is 2·65027.
3. After exposure to a strong heat, the density is 2·65022.
4. The color of smoky quartz is due to organic matter containing carbon and nitrogen.
5. This organic matter is entirely decomposed by heat, and yields, by dry distillation in a current of hydrogen, pure carbonate of ammonia.
6. The dark color disappears on the application of heat.

The results at which Professor Forster arrives will be the subject of considerable discussion in the scientific world, as they seem to point out the organic and aqueous origin of quartz rather than to its igneous irruption, as a majority of geologists have maintained. The almost simultaneous publication of the investigations of Friedel and Crafts on the organic compounds of silica, and the conclusions of Professor Wurtz, published last year in this journal, will be read with renewed interest, now that the subject is attracting so much attention. It would be strange indeed if we were to look to life and organic growth for the source of our sandstones and sand banks. And yet, under present appearances, it is not at all unlikely that we shall be compelled to do so. We have observed in the Berkshire sand, employed in the manufacture of the best crown glass, that innumerable black specks were scattered through it, which we took to be oxide of iron; but we were informed by the director of the works that they were organic and wholly destroyed by heat, thus obviating the necessity of adding manganese to neutralize them. It would be interesting, in this connection, to see if the black sand of the West does not also owe its color to organic matter, instead of to iron as has usually been supposed. The fact could be easily determined by exposing a quantity of the material to a sufficiently high heat.

RAVAGES OF THE BOMBARDMENT OF PARIS.

M. Secretan, the well known manufacturer of philosophical instruments, writes as follows to Abbé Moigno:

"As you know, without doubt, since I have communicated the circumstance to a number of persons, I have al o cruelly suffered by the bombardment. On the 9th of January, at 7 o'clock in the morning, a large bomb fell and burst in my workshop in the *Rue Mechain*. The furniture was much damaged, and a considerable quantity of astronomical instruments, photographs, and optical glass was entirely destroyed.

"The damage amounted to from 18,000 to 20,000 francs. Fortunately my dividing engine was uninjured, my optical plane, for the construction of astronomical objectives according to Foucault, also received no harm; and I must confess that, considering the risk I ran, I am quite satisfied to have escaped as well as I did."

HYDRATE OF CHLORAL.

The hydrate of chloral, which in 1869 cost eighty dollars a pound, so that each sleep produced by it could be reckoned at one dollar, is now advertised on the list of a German chemical factory at about two dollars a pound. Such an enormous reduction in the price of a chemical product in so short a time has rarely occurred. Perhaps the only parallel case is metallic sodium, which, a few years ago, could not be had for two hundred dollars a pound, but can now be made for seventy-five cents. According to Dr. Richardson, the secret use of chloral in England has become so great that the victims must be put in the same class as the opium eaters. In proof of the enormous consumption, he states that, during the last year and a half, four dealers have sold forty tuns, sufficient to give narcotic doses to 36,000,000 people—in other words, every person in England could have had one good sound sleep out of the amount sold. In reference to the *maximum* dose that it would be safe to take, Dr. Richardson puts the amount at one hundred and twenty grains; he regards one hundred and eighty grains as likely to prove fatal. He also warns against the gradual increase of the dose, as its effect upon the organism is just the opposite of opium, the system, in fact, becoming more sensitive the longer it is used.

SOUTHERN LIGHTS.

We have all heard of the northern lights, or *aurora borealis*, but we are not in the habit of reflecting that the same phenomenon is to be seen in the southern hemisphere, where it is called the southern light. In order to establish a relation between the magnetic disturbances in the north and south, and to prove that there is a perfect coincidence and simultaneousness in the auroral light of the two hemispheres, Professor Heis, of Munster, has entered into a correspondence with the directors of observatories at various stations in Australia and the East, and has been able to collect much interesting and novel information, which may serve as data in the solution of the question of the probable origin of this class of phenomena.

From records kept in 1870, it appears that the aurora of the 8th of January was observed at the same time in Oxford, Liverpool, and Melbourne. Magnetic disturbances were noted, on the 4th of January, in Melbourne, Rome, and various stations in France and England. The southern light of February 1, in Melbourne, was the northern light, at the same time, in Paris, London, Königsberg, Stockholm, and other European cities. March shows several instances of similar coincidence in magnetic and auroral phenomena. Some months were exceedingly rich in simultaneous auroras, and there was not a month in which coincident observations were not made. It adds very much to the grandeur of these phenomena to know that they are visible at nearly the same moment entirely around the globe, and, as soon as we have a long series of observations, we shall be better able to give a rational explanation of their probable origin.

[For the Scientific American.]

A LIGHT UNIT.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

The measurement of the intensity of artificial light is one of the problems that has not been satisfactorily solved, though many able physicists have given it their earnest attention.

Among the instruments that have been contrived to accomplish this result is the chlor-hydrogen photometer, first introduced by Professor J. W. Draper, and afterwards modified by Bunsen and Roscoe. Though this instrument is very beautiful and philosophical in its action, it is open to the objection that it measures rather the chemical or actinic than the illuminating power of a flame. The polariscope photometer of Arago, and the electro-photometer of Masson, are also very ingenious instruments; but the difficulties attending their use have, thus far, prevented their introduction.

The photometer generally employed is that of Ritchie or of Bunsen, and especially the latter. The principle involved in its action is the determination, by well known means, of the relative brilliancy of two lights, one of which is supposed to be invariable. Heretofore, the invariable light, or unit, has been a flame produced by a candle, which is defined as "a sperm candle of six to the pound, burning at the rate of 120 grs. per minute." With this the second flame is compared; and, if it is ten or fifteen times as strong, it is spoken of as being a ten or fifteen candle light.

Though this method is reliable in theory, in practice it is open to error, owing to the variability of what should be the invariable light or unit. If we could always obtain sperm candles possessing the same composition, the indications might be received with a certain degree of reliance; but when we remember that, at present, the so called sperm candles are made of different materials, in different proportions, we see how little confidence is to be placed on a light unit of this description; and it is the object of this communication to detail the results of an attempt to obtain a reliable and invariable light unit.

It is evident that, if a given solid is heated to a certain temperature, it will emit a light of a definite or corresponding intensity. At the same time, the solid will undergo a certain expansion which may be employed to indicate or measure the intensity of the light emitted. I therefore arranged a fine platinum wire so that it was heated by a Bunsen flame, and the amount of expansion and equivalent light determined. It was soon found that, though the arrangement was very well in theory, the practical difficulties in its construction and mode of action were such that it would not answer. I consequently resorted to the following modification, in which measurements of expansion of the wire are not necessary:

A flame of pure dry hydrogen, burning at a definite rate, was caused to impinge upon a platinum coil, when it was found that, so long as wire of the same diameter was used in constructing coils of the same dimensions, the latter, on being subjected to hydrogen flames issuing from burners that were similar in all respects, always emitted a light of the same intensity.

The dimensions of the coils and burners employed in my experiments were as follows: A platinum wire, one decimeter in length, and weighing twenty-five centigrammes, was wound into a close spiral coil of five turns, four millimeters in diameter on the outside. The remainder of the wire was then turned up parallel to the axis of the coil, and terminated in a hook by which it was suspended over the hydrogen flame.

The burner presented a circular opening, one millimeter in diameter. The platinum spiral was suspended over this so as nearly to touch it, and the supply of hydrogen regulated to produce a flame which kept the whole coil at a white heat.

Such an arrangement is easily reproducible in any locality, and when the rate of combustion of the hydrogen is the same, it must necessarily emit a light of the same brilliancy; it consequently provides a light unit, which meets all the conditions of the problem.

The want of intensity in the above described light unit may be urged as an objection, but it is rather an advantage than otherwise, when lights of low intensity are to be examined. If the brilliancy of the light to be measured is very great, any objection on this account is easily remedied by determining the value of an ordinary gas or candle flame in the above light unit, and employing it as an intermediate unit of comparison, from which the value of the brilliant light may be calculated in the proposed light units.

Among the advantages gained by such a light unit is the elimination of errors arising from the variation in the light giving power of the volatile hydrocarbons, produced in the combustion of a candle. According to Dr. Frankland, the luminosity of such flames depends—not on the incandescence of solid particles, but on the luminosity of the gases or vapors produced in the flame during combustion. Since the composition and luminosity of these gases must vary greatly with the temperature, rate of combustion, and nature of the material composing the candle, it is evident that there must be similar variations in the brilliancy of the resulting flame. The use of an incandescent solid, as the platinum wire, avoids this and other sources of error, and reduces the conditions for the production of the light unit to the simplest state.

Tunnel between England and France.

Another project for a submarine roadway under the English channel has been mooted, and a committee of engineers has approved the plan, which is the production of a Frenchman, M. Thome de Gamond. There is novelty in the scheme. It is proposed to tunnel under the channel between New Haven and Dieppe where the distance between the two countries is 64 miles, in preference to between the South Foreland, near Dover, and Cape Grisnez. near Calais, where it is only twenty miles. The reason for this choice of locality is not apparent.

Sheehan's Patent for Steelifying Iron.

In another column we publish the story of Thomas Sheehan, and how he happened to make an invention by which he has accumulated a fortune. Annexed is a list of the railroad companies who are using his process for steelifying iron, and the amounts paid for the privilege:

Chicago & Northwestern	\$3,500
Michigan Central	1,500
Chicago, Burlington, & Quincy	2,000
Atlantic & Great Western	1,900
Pennsylvania Central	4,000
Pittsburgh, Fort Wayne & Chicago	2,000
Central, of New Jersey	1,200
Camden & Amboy	1,200
Little Miami, Columbus, & Xenia	800
Schenectady Locomotive Works	500
Chicago, Rock Island, & Pacific	1,200
St. Louis & Iron Mountain	800
North Missouri	800
Lake Shore & Michigan Southern	4,000
Vandalia, Terre Haute, & Indianapolis	950
St. Louis & Indianapolis	800

A number of other railroad companies are using his invention, that have not yet settled with the patentee, but who acknowledge their liability; and still others, against whom suits have been brought in the United States Courts, which have not come to trial. A judgment has been obtained against one of the companies very recently for \$12,800, which has not been settled.

IT is a shameful thing to be weary of inquiry, when what we search for is excellent.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

LAMP.—Dr. Franklin T. Grimes, Liberty, Mo.—The invention relates to the class of lamps in which a tube or funnel is combined with the bowl, the said tube or funnel extending from the top of the bowl of the lamp down to within a short distance of the bottom of the same, whereby the bowl is converted into a fountain reservoir, in which, when it is filled, there is a vacuum formed above the surface of the oil or liquid, which is consequently maintained at a higher level than it is within the lower mouth of the said tube or funnel where it is subject to atmospheric pressure. The invention consists mainly in a peculiar arrangement of the valve apparatus, whereby certain advantages are attained in the regulation of the supply of oil to the wick tubes, in filling the reservoir, and in other operations incidental and necessary to the use of the lamp.

INSECT TRAP.—Thomas Wier, Lacon, Ill.—This invention relates to the use of two or more pieces of wood, of any form or size, and fastened together in any way, and either with or without cracks, slits, or crevices made in them, said pieces being intended to be placed among the branches of fruit trees, or on the ground near fruit trees, and to serve as a trap for the larvæ of moths, and other noxious insects,

HANDLE STRAP FOR TRAVELING BAG.—Arthur Alexandre, o. New York city.—To the frame of a traveling bag are attached rings, which are preferably made square, as allowing the strap to be passed through them more readily. The strap is made of sufficient length to adapt it to serve as a shoulder strap, and may be made in one piece, or in two pieces connected by a buckle. The ends of the straps are passed through the rings, and are secured to the body of the strap by a button, by sewing, or by other convenient means. To the strap, at a distance from its ends equal to about one third the distance from the ends to the center of the straps, are attached two hooks. The middle part of the strap is made double by having the ends of a short strap attached to it, and has holes formed in the lower ply to receive the hooks. To adjust the handle strap for use as a handle, the hooks are passed inward through the rings and brought upward along the under side of the strap, and hooked into the holes in the lower ply of its double middle part. To adjust the strap for use as a shoulder strap, the hooks are unhooked, and the strap is drawn out to its entire length. Keepers or slides are placed upon the strap, near the hooks, and, when the strap is extended for use as a shoulder strap, are slipped over the hooks to cover them and keep them from catching upon anything with which the strap may come in contact.

FLAG HALYARD.—William Albert, Brooklyn, N. Y.—This invention relates to an improved manner of securing flag halyards; and it consists in attaching them to a weight or traveler fitted on a rod or guide attached to the royal backstays of a ship or other convenient place, or to the flag staff near its base, so that it can rise and fall as the halyards vary in length according to their condition of dryness, thereby always keeping them taut but not overstraining them, as they will be if made fast when becoming very dry and then becoming wet. This plan will not injure the halyards, while it will always keep them taut and trim. In the common way, they will sometimes be altogether too slack, and at others so taut as to be broken by the strain.

THILL COUPLING.—Coleman Bridgman, St. Cloud, Minn.—The object of this invention is to furnish a simple, convenient, and safe coupling for thills of buggies, wagons, etc. It consists in a jointed coupling pin and slotted ear, and also in a slotted washer, arranged to form a simple, durable, and perfectly safe coupling, without screws or spring, that can be adjusted without hammer, wrench, or other tool, without trouble, and in an expeditious and easy manner.

WASH BOILER.—Silas Bennett, Newcastle, Pa.—This invention has for its object to furnish an improved boiler for washing clothes, which shall be so constructed and arranged as to distribute the circulating suds evenly over all parts of the clothes, so as to wash the clothes evenly and avoid staining them, as is the case where large streams of suds are discharged continuously in one place. It consists in the construction and arrangement of the various pipes and distributing tubes, with a flanged and perforated bottom, vertical and cross strips, constructed and arranged in connection with each other, to accomplish the purpose set forth.

FAN MILL.—Alexander Plymate, of Blue Earth County, Minn., administrator of Franklin H. Plymate, deceased.—This is an improvement in fan mills, which consists in a peculiar construction of the feed board, and in the use of a two part shoe for the support of the sieves, the parts being arranged in a peculiar manner, to make the machine effective and compact.

COUPLING HOOKS FOR COAL CARS.—Frank Bush, of Boonton, N. J.—In the ordinary coupling hook the inner link is passed through a hole in the forward part of the shank of the hook, and is then welded, so that when it is necessary to repair or renew the link, the entire hook has to be detached from the car and taken to the shop, where it requires at least three men to handle it upon the anvil while the link is being welded. To avoid this inconvenience and expense, the inventor forms a second or inner hook upon the shank of and just inside of the outer hook. The point of the inner hook extends back parallel with the shank of the outer hook, so as to enter a hole in a plate on the end of the draw bar. By this construction, by loosening the hook, the coupling link or ring may be readily placed in or removed from the inner hook, and when the hook is again drawn to its place it will be impossible for the link or ring to become detached.

Examples for the Ladies.

Mrs. W—— has had a Wheeler & Wilson Machine since June, 1857; to January 1st, 1871, she had made 24,476 vests, (in 1870, 2,255 vests,) 17 coats and 50 pairs of pantaloons, besides doing the family sewing for six persons; all the work ranging from the finest muslin to the heaviest beaver cloth.

"**Whitcomb's Asthma Remedy** made me a well man."—*W. O Brown, Toledo, Ohio.*

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

COIL IN BOILERS.—In answer to M. S. M., in relation to coil in boiler, I would say that his plan of heating water is not practicable. The sudden contraction of his coil, when the water supply is turned on, will start any joint he can put in. I have tried 2¼ inch wrought pipe (very heavy), running it through fire box, over bridge wall to back end of boiler; the pipe 8 feet long would contract 1 8-12 inches, as soon as water was turned on, and of course start a joint or burst the connections. If S. W. will use a heater of 5 inch pipe, such as is used for casing oil wells, say 10 feet long, and put in six lengths of 1 inch pipe, using return bends, and let his exhaust steam heat his water, he will be on a sure safe footing; and if he has it arranged so as to have a steady continuous feed on his boiler, so much the better, for he will use less fuel and have no explosion. —E. A., of Pa.

EXTERMINATING RATS AND MICE.—I saw an inquiry, from one of your readers, how to exterminate rats and mice. One of the best remedies I have used is an equal mixture of flour and plaster of Paris. It is preferable to poison, because it will not hurt cats when catching them. —F. S., of Pa.

FLOATING OF SOLID IN MOLTEN IRON.—Permit me to suggest, in answer to S. H. W., that the probable cause, of cold iron floating on melted iron, is the attraction of cohesion in the latter. Light pieces of metal, such as a piece of fine wire, a small sewing needle, or a flat piece of sheet lead will float on water, and the only satisfactory reason of its doing so which occurs to me is, that the attraction of the particles of water for each other is sufficient to resist the passage of such light objects through its surface.—W. J. B.

J. R., of Slippery Rock, Pa.—The mineral you send appears to be an earthy carbonate of iron, and should be assayed to determine its value. It would be of interest to know how it occurs, whether in beds or veins, in either case how thick, as well as the direction and amount of dip; the associated rocks, above and below, whether shale, limestone, etc.; whether reddish nodules, or lumps of an iron ore with concentric coatings, occur in the vicinity.

WHAT MUST I DO?—When botches want to borrow my nice tools, and when I will not lend them, they call me names. Must I stand and take it, or lend the tools?—J. P. W. . . . . . .
Answer.—Read the Beatitudes, Matthew V., 10, 11, and learn the blessedness of persecution.

J. I. M., of Pa.—Relatively to the axle, all parts of a rolling wheel move with an uniform velocity. Relatively to the plane upon which it rolls, the advance movement of the top of the wheel is temporarily greater than that of the bottom; but as all parts of the perimeter are successively top and bottom, the average advance of each part is equal.

A. J. H., of Mass.—All else being equal, the mechanical powers of screws are relatively as their pitch, or the number of threads to the inch on each, without respect to their diameters; but the larger the diameter of the screw with a given pitch is, the less is its friction in working, owing to the reduction of the inclination of the thread. A screw of larger diameter will raise greater weight without stripping the thread, than one of smaller diameter with equal pitch. For these reasons, to make an easy working and durable screw, it is better to make them of larger rather than of smaller diameter.

G. K., of N. Y.—Friction does not increase with the increase of surface, but—with some slight variations, not yet fully accounted for,—directly as the pressure of the rubbing surfaces against each other. This answer refers to the static or fixed force required to overcome the friction of bodies, and not to the power consumed in overcoming it for a given space of time, which will be as the coefficient of friction in pounds, multiplied by the space it overcomes in each minute of time; this will be expressed in horse power by the quotient obtained in dividing the product by 33,000.

G. L., of Minn., sends us a bit of maple branch, containing a peculiar insect, nicely housed therein, and asks what the bug is. It is a Hymenopter, one of the "wood-wasps," as the Germans call them, or "horn-tails." The long horny borer at the end of the body, contains two fine, serrated needles for boring holes, in which they deposit their eggs. This species is the *Tremex columba*, and usually infests the elm, buttonwood, and pear. The grub or larva is yellowish white, about an inch and a half long, with a horn on the hind end.

J. C. C., of Pa.—Your mineral specimen is simply hornblende —of no use in the arts.

C. D. A., of N. Y.—The subject of balancing cylinders was treated at great length in Vol. XIII. of the SCIENTIFIC AMERICAN, and we do not wish to reopen it at present.

C. B. R., of N. B.—The draft of a furnace might undoubtedly be greatly improved in the manner described.

HINDRANCE TO THE FLOW OF WATER THROUGH PIPE.—J. R. B., query 17, page 187, says the descent in his pipe is even, but I presume an accurate profile would show a slight depression at some point, perhaps at the spring. A depression equal to the diameter of the bore would be sufficient to prevent the air from escaping at the upper end; and if the current is not rapid enough to carry it through, it will remain, and its accumulation is virtually so much subtracted from the fall, thus retarding the flow. When the hight of the column of confined air becomes equal to the difference of level between the spring and the discharge—that is, when its lower end reaches as much below the level of the discharge as its upper end is below the level of the spring,—the water pressure becomes equalized, and the flow stops. The remedy is very simple. Make a small hole or leak in the top of the pipe, at the summit, or highest point below the depression, and leave it open permanently for the escape of the air.—O. A. B., of N. Y.

GAS FOR TOY BALLOONS.—C. B. S. can make this gas by pouring slightly diluted muriatic acid upon an equal weight of zinc, in a covered vessel having a small tap or stop cock in the top for filling the balloons. The vessel should be made of lead, to prevent corrosion. It is impossible to estimate the amount of material, as the balloons generally vary greatly in size. He should be very careful with the gas; it is highly inflammable.—C. O. I., of Pa.

SKELETON LEAVES.—J. V. M., query 3, October 14, will find that strong vinegar will destroy all the pulpy matter of leaves, without injuring the fibrous parts. Leaves with woody fibers, such as those of the different species of ivy, require to be left in the vinegar for a fortnight or longer. The skeletons can be bleached by chlorine gas, of which commercial chloride of lime is the most convenient preparation for the purpose.—D. B., of N. Y.

ARTIST'S CANVAS.—J. T. M. C. can make a very cheap canvas by stretching a sheet of damp paper on a pane of glass or board, and, when partially dry, pasting on it four or five pieces of thin muslin, each piece being allowed to dry before another is put on; and all must be stretched very tight, and rubbed smooth. The paste should be made of isinglass rather than flour. Then cover it with white lead, using as little as possible, putting it on with a knife. After several days, give it a coat of paint and stipple it with a blender to give it a tooth. Leave it on the glass till the picture is finished.—E. S. S., of ——.

FORCE OF FALLING BODIES.—Let me inform J. E. that: As the accelerating influence of gravitation upon a falling body, and its retarding influence upon an ascending body, are equal, the force of the blow struck by the falling body, if all the force could be utilized, would be exactly enough to raise the body again to the place from which it fell. Hence, to find the force of a falling body, multiply its weight, in pounds, by the hight in feet from which it has fallen, and you have the force in foot pounds. And it may interest J. E. to know further that to find the striking force of a body moving in any direction, he may use the following formula: Divide the velocity, in feet, per second, by 8 (or, for greater accuracy, 8·04), and multiply the square of the quotient by the weight of the body. This gives the striking force in foot pounds.—W. H. P.

AQUARIUM CEMENT.—C. E. G. wishes to know how to make aquarium cement. Here is a receipt, which I think is good, taken from a newspaper: Take one part, by measure, of litharge, one of plaster of Paris, one of fine beach sand, and one of finely powdered rosin. When wanted for use, make into putty with boiled linseed oil.—E. M. D.

CORRECTION.—In publishing my answer to D. D. D., of N. Y., you made me say, "better not use back gear," or something near this: it should read: "better use back gear." It is essential that the speed be slow.—W. W. T., of N. Y.

INK STAINS ON LEATHER.—H. S., query 4, September 30, should try oxalic acid, or the so called salts of lemon. I have used the former, but it varies in its effect upon different leathers.—D. B., of N. Y.

HEATING SURAFCE OF BOILERS.—C. & H. A., query 1, Oct. 14, will find the following to be the proper proportions: For locomotive boilers, there should be about 80 square feet for each square foot of grate bars, and, on each square foot of grate bars, about 1 cwt. of coke or coal should be burned per hour. In stationary boilers, the number of square feet of heating surface required to evaporate a cubic foot of water per hour is about 70, in Cornish boilers; and the heating surface, to each square foot of fire grate, should be from 13 to 15 square feet in wagon boilers, and 40 square feet in Cornish boilers.—D. B., of N. Y.

BUGS ON PLANTS.—Insects and lice, infesting plants, may be effectually destroyed by the application of white hellebore in fine powder. —C. T., of Vt.

TENDER GUMS.—If your correspondent, W. W. G., will use common salt and a soft brush, when cleaning his teeth, his gums will soon get hard.—J. B. N., of Ohio.

TABLE CUTLERY.—The worst agent now known for the destruction of table cutlery, is the steel knife sharpener, recently invented, and in general use. I have been obliged to discard it, and to use the grindstone, as formally, and have no further trouble with my knives.—C. T., of Vt.

GRINDING CLAY.—Answer to D. H. S., Jr., query No. 15, Aug. 26. The means required are a pair of rollers, horizontally fixed on a substantial bed three or four feet in hight. One roller must travel faster than the other. A trough, with scrapers to throw down the detached clay, with suspended weights attached, will also be required.—J. M. Mc., of —.

CLOTH FOR BRICK HACKS.—D. H. S., Jr., query 16, August 26. Oil cloth or felting is used for this purpose, and should be nailed to strips of lathing, or better still, to iron strips bent at right angles, with a string to hook on to the bottom board of the hack.—J. M. Mc., of ——.

BURNING BRICK WITH WOOD.—D. H. S., Jr., query 17, August 26.—It is difficult to answer this query, without knowing the class of clay. J. M. McC., of ——.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—TEMPERING SMALL STEEL GOODS.—How can I temper a piece of steel about four inches square and three fourths of an inch thick, with two holes in it, so as to keep the holes in shape, and the steel from cracking while tempering?—M. C. M.

2.—LINSEED OIL STAINS.—How can I take linseed oil stains out of rough cut stone or granite, without leaving any marks on the stone?—M. C. M.

3.—VARNISH FOR WALNUT FURNITURE.—How can I varnish old walnut furniture after rubbing it down with pumice stone? I get the surface smooth and clean, and apply varnish; but when it has dried, I find that it runs into holes as if the wood absorbed it in places. What filling can I use before varnishing? And how can I treat walnut so as to cave a bright gloss, without polishing with shellac polish?—M. C. M.

4.—CEMENT FOR IRON AND LEATHER.—What kind of cement shall I use to fasten leather covering to iron pulleys, for running band saws upon?—E. D.

5.—PASTING GLAZED PAPER.—Is there any substance which will destroy the acid in flour paste, and further the drying of it when used on glazed paper? I think the acid and slow drying destroy all the glaze on paper. I have used hot and cold glue, gum arabic, and gum tragacanth, but they are too expensive for general use.—F. S.

6.—MARBLEIZING SLATE.—What is the process and the kind of material used for marbleizing slate? Is the art common to the public, or is it secured by patent? Has the patent expired?—T. S.

7.—CLEANING ZINC.—How can I clean zinc in ice chests to bring it back to its original color? What shall I use, and how shall I use it?—W. H. W.

8.—BUTTER WEED FOR PAPER MAKING.—Will some one of your readers inform me if the weed known as butter weed (which grows spontaneously upon all of our new rich lands to the extent of three to four tuns per acre) can be used for the manufacture of paper, or for any other purpose? If so, what is the probable value per tun?—W. M. B.

9.—AEROSTATIC TOY.—A neat toy is often constructed thus: Take a large currant, thrust a pin through its center, place it carefully upon the upper end of a dandelion stem or other small tube, holding the other end in the mouth, blow a strong, continuous blast, and the currant will remain suspended in the air as long as you continue to blow, even when the tube is considerably inclined from the perpendicular. What is the explanation? Has the principle, upon which it depends, been applied to any practical purpose?—H. T.

10.—IMITATION AMBER COMB.—Can any one give me the *modus operandi* of making such an imitation?—S. B. I.

11.—CONTENTS OF A PYRAMID.—Is there any rapid method of computing the number of cannon balls in a triangular pyramid?—T. G. T.

12.—FALLING BODIES.—T. E. N. E., of Mass., in answer to query of J. E., Sept. 2d, gives: T equals the square root of Q S divided by G: as a formula applicable to falling bodies, in which Q equals the quantity of matter. Will he explain what the quantity of matter has to do with a falling body, apart from its momentum, especially in a vacuum? He speaks of space, velocity, quantity, and time without designating whether he means feet or inches, minutes or seconds, pounds or tuns; and in case J. E. gets a single one wrong, the formula will mislead him.—H. A. W.

13.—STAINS ON GILDING.—I have got a French gilt mantelpiece clock on which are a number of spots, which look like verdigris. Can any of your numerous correspondents tell me how to get rid of these? The clockmakers I have taken it to say they can do nothing with it.—A. M

14.—CLEANSING THE HAIR.—What is the best method of cleansing the hair of gum or dirt, without injury to the hair or scalp? This is asked by many engineers who are often compelled to work all the week and late on Saturday night, making a visit to the barber impossible. Also, what preparation is commonly used by barbers for shampooing?—H. L. J.

15.—VINEGAR FROM SOUR ALE.—Can any of your correspondents give me a good recipe for making sour ale into vinegar?—C. H. F.

16.—BACK PRESSURE IN EXHAUST PIPE.—We run our exhaust steam from a 150 horse Corliss engine, through 1,300 feet of five inch steam pipe. The pipe runs from one end of the dry house to the other twelve times, the turns being made by elbows of the same size as the pipe. At the end the steam is allowed to exhaust in the open air without any check. Query—Is there any appreciable back pressure? If so, how much? —J. W. H.

17.—ALLOY.—How can I make an alloy that will melt at 1,000 degrees, which will possess sufficient strength to make a steam cylinder, three inches in diameter, to withstand a pressure of fifty pounds?—J. B. N.

18.—PROPORTIONS OF STEAM BOILER.—If a steam boiler of four feet diameter and one fourth inch plate will stand a pressure of sixty pounds, is it not reasonable to conclude that a bhiler one foot in diameter and one sixteenth inch plate will stand the same strain with equal safety?—J. B. N.

19.—PRESERVING SHINGLES.—Can any one furnish a recipe for a wash to apply to shingles to prevent decay?—J. M. G.

20.—PROPORTIONS OF CYLINDER.—Can any one solve the following problems: Given the hight and number of gallons of a cylindrical vessel, to find the diameter. Given the diameter and number of gallons of a cylindrical vessel, to find the hight. Given the area of a circle, to find the diameter (in feet and inches).—W. G. N.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

BOILER EXPLOSIONS.—C. E. G.—W. M.
CANAL BOATS.—W. W. R.
COIL OF PIPE.—B. G.
ETHER CONTROVERSY.—C. T. J.
INFLUENCE OF COLOR IN DEVELOPING LIFE.—C. F. P.
METAPHYSICAL ARTICLES.—F. G.
NARROW GAGE RAILWAYS.—J. P.
PAINE'S ELECTRO-MOTOR.—S. J. K.
PROPERTY IN INVENTIONS.—J. E. S.
SELF-ACTING BLOWPIPE.—W. J. C.
THE GULF STREAM.—J. P. W.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE

FOR THE WEEK ENDING OCTOBER 10, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

For Copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1866 *at which time the Patent Office commenced printing them* .... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information, as to price of drawings in each case may be had by addressing

MUNN & CO.,
Patent Solicitors. 37 Park Row. New York.

119,684.—HARNESS.—I. H. Alexander, Newfield, N. Y.
119,685.—STEAM ENGINE.—J. F. Alexander, Shelby, N. C.
119,686.—TREADLE.—R. N. Allen, Pittsford. Vt.
119,687.—POTATO PLANTER.—L. A. Aspinwall, N. Y.
119,688.—BED.—F. P. Baldwin, C. T. Segar, Utica, N. Y.
119,689.—SPIKE MACHINE.—M. Belknap, Philadelphia, Pa.
119,690.—SEWING MACHINE.—R. Blees, Brooklyn, N. Y.
119,691.—HEEL.—E. P. Bray, Elizabeth, N. J.
119,692.—SADDLE BOX.—W. H. Brough, Coatesville, Pa.
119,693.—ROLLING MILL.—W. H. Brough, Coatesville, Pa.
119,694.—EVAPORATOR, ETC.—F. G. Butler, Bellows Falls, Vt
119,695.—TURNING, ETC.—R. M. Clapp, Vergennes, Vt.
119,696.—SAW FRAME.—W. Clemson, Middletown, N. Y.
119,697.—HARNESS.—C. H. Drury, Osceola, Ill.
119,698.—CANOPY.—J. Ellisdon, Liverpool, Eng.
119,699.—LIQUID METER.—N. Finck, Elizabeth, N. J.
119,700.—SAUSAGE STUFFER.—C. Forschner, New York city
119,701.—SAWING MACHINE.—J. Groat, Peru, Ind.
119,702.—BENDING WOOD.—Gustaf Gustafson, Chicago, Ill.
119,703.—IRONING TABLE.—C. C. Hardy, Rutland, Vt.
119,704.—RAISIN SEEDER.—J. Harrington, New London, Conn.
119,705.—CUSPADORE.—E. A. Heath, New York city.
119,706.—CUSPADORE.—E. A. Heath, New York city.
119,707.—POLISHER.—C. H. Helms, Poughkeepsie, N. Y.
119,708.—CLOTH PRESSER.—P. Howe, Boston, Mass.
119,709.—WATER METER.—H. J. Hyams, Pittsburgh, Pa.
119,710.—INLAYING.—J. W. Hyatt, Jr., Albany, N. Y.
119,711.—STAPLE MACHINE.—W. Malick, Erie, Pa.
119,712.—HARVESTER. L. J. McCormick, W. R. Baker, Chicago, Ill.
119,713.—FIRE ALARM.—J. N. Pitts, J. E. Russell, Niagara, N. Y.
119,714.—WATER METER.—A. O'Leary, Iowa City, Iowa.

119,715.—STAMP.—G. Pardy, San Francisco, Cal.
119,716.—BENDING TIRES.—D. F. Pomeroy, Painesville, Ohio
119,718.—STOVE.—A. C. Rand, Chicago, Ill.
119,719.—STOVE.—A. C. Rand, Chicago, Ill.
119,720.—HYDROCARBON BURNER.—A. C. Rand, Chicago, Ill.
119,721.—HAY RAKE.—M. C. Remington, Weedsport, N. Y.
119,722.—CARRIAGE CURTAIN.—W. H. Rhodes, Lancaster, Pa.
119,723.—FIRE BRICK.—E. F. Rogers, Chelsea, Mass.
119,724.—TREADLE.—H. C. Smith, Cleveland, Ohio.
119,725.—HOLLOW WARE.—N. Thompson, Brooklyn, N. Y.
119,726.—PLIERS.—N. Thompson, Brooklyn, N. Y.
119,727.—BED BOTTOM.—C. Van Deusen, Clarksville, N. Y.
119,728.—BUGGY TOP.—J. B. Weller, Bellbrook, Ohio.
119,729.—GRAPPLE.—H. Whitall, Philadelphia, Pa., and J. Burson, Yates City, Ill.
119,730.—SASH HOLDER.—E. S. Wills, Philadelphia, Pa.
119,731.—COTTON PRESS, ETC.—J. M. Albertson, New London, Ct.
119,732.—CHAIR.—W. Aldrich, Proctorsville, A. F. Spaulding, Northfield, Vt.
119,733.—CUTTER.—C. G. Armerling, Philadelphia, Pa.
119,734.—HOOF PARER.—I. Baker, Long Branch, Mo.
119,735.—MOVEMENT.—A. Benneckendorf, Hoboken, N. J.
119,736.—WAGON BRAKE.—G. M. Bennett, Burlington, Iowa.
119,737.—STENCIL PLATE.—H. Bolthoff, Central City, Col.
119,738.—COAL SCUTTLE.—J. A. Bragaw, New York city.
119,739.—KNOB.—J. Britton, Williamsburgh, N. Y.
119,740.—CURTAIN FIXTURE.—N. Campbell, Rochester, N. Y.
119,741.—SHANK LASTER.—O. R. Clark, La Fayette, Ind.
119,742.—RAISING VESSELS.—T. Collier, New York city.
119,743.—BOARDING LEATHER, ETC.—O. Coogan, Pittsfield, Ms.
119,744.—CANAL BOAT.—O. Coogan, Pittsfield, Mass.
119,745.—BROOM NEEDLE.—G. M. Cowardin, Gardner, Tenn.
119,746.—GRINDING MILL.—W. H. Culver, West Troy, N. Y.
119,747.—DRYING ROOM.—R. Dalrymple, Galt, Canada.
119,748.—INHALER.—E. E. Duncanson, Chicago, Ill.
119,749.—STUD.—W. R. Dutemple, Providence, R. I.
119,750.—CULTIVATOR.—D. B. Eberly, Pine, Ind.
119,751.—LUBRICATOR.—E. Ehlin, San Francisco, Cal.
119,752.—WIRE BRUSH.—F. F. Field, Stapleton, N. Y.
119,753.—PHOTOGRAPH.—C. A. Gale, Piqua, Ohio.
119,754.—CHAIR.—W. Gardner, Glen Gardner, N. J.
119,755.—VALVE.—F. Glasson, New York city.
119,756.—DEODORIZER.—P. N. Goux, Paris, France.
119,757.—VALVE.—S. E. Griscom, Mahanoy Plane, Pa.
119,758.—LOCK.—F. Gyss, New York city.
119,759.—DITCHING MACHINE.—O. F. Hale, Irvington, Iowa.
119,760.—PIANOFORTE.—A. H. Hastings, New York city.
119,761.—GAS HEATER.—J. P. Hayes, Philadelphia, Pa.
119,762.—STREET LANTERN.—M. A. Heath, Providence, R. I.
119,763.—ELECTRIC BATTERY.—V. Himmer, New York city.
119,764.—RAM.—C. Hodgkins, Marlborough, N. H.
119,765.—SLING.—F. Hohorst, New York city.
119,766.—RAILWAY CAR.—K. E. Holmes, Cambridgeport, Mass.
119,767.—LOCK NUT.—W. P. Horton, Milwaukee, Wis.
119,768.—DUST RING.—G. Hunt, Springfield, Mass.
119,769.—SLIDE VALVE.—C. H. Hutchinson, Concord, N. H.
119,770.—EXTRACTOR.—W. H. Ives, Luzerne, N. Y.
119,771.—PRESS.—J. B. Jones, Williamsburgh, N. Y.
119,772.—SOAP.—C. R. Kicherer, Brooklyn, N. Y.
119,773.—CHANDELIER CENTER.—J. Kintz, West Meriden, Ct.
119,774.—HORSE POWER.—J. W. Knox, Winona, Miss.
119,775.—COLLAR.—H. A. Lee, New York city.
119,776.—FRUIT BOX.—E. D. Lewelling, San Lorenzo, Cal.
119,777.—DOUBLE TREE.—A. Lomax, Laporte, Ind.
119,778.—TANNERS' WHEEL.—P. Lull, Norwich, N. Y.
119,779.—SAP BUCKET.—R. Marshall, Hobart, N. Y.
119,780.—CENTER.—J. Meah, Meriden, Conn.
119,782.—COMPOUND.—F. M. Moore, Chico, Cal.
119,783.—FLOUR BOLT.—T. G. Morgan, Murfreesboro', Tenn.
119,784.—SEWING MACHINE.—C. Parham, Philadelphia, Pa.
119,785.—CANDLE BURNER.—J. A. Pease, Catskill, N. Y.
119,786.—CULTIVATOR.—F. L. Perry, Canandaigua, N. Y.
119,787.—STOVE GRATE.—J. A. Price, Scranton, Pa.
119,788.—WHEEL.—W. F. Ray, Fort Wayne, Ind.
119,789.—SLIDE VALVE.—J. Rigby, J. Holt, Marquette, Mich.
119,790.—LOCOMOTIVE.—A. M. Rodgers, Brooklyn, N. Y.
119,791.—PAN SCRAPER.—G. Scherer, Boston, Mass.
119,792.—CANAL BOAT.—C. Schilling, New York city.
119,793.—STOOL.—C. A. Schindler, Hoboken, N. J.
119,794.—DESK.—A. Schlag, Brooklyn, N. Y.
119,795.—ICE MACHINE.—C. A. Seely, New York city.
119,796.—ENDLESS SIDEWALK.—A. Speer, Passaic, N. J.
119,797.—ROTARY ENGINE.—J. Scott, Burlington, Iowa.
119,798.—LOOM.—J. J. Switzer, Boston, Mass.
119,799.—DUMPING GRAIN.—J. Sypes, Fairbury, Ill.
119,800.—BRAKE.—T. Thorn, St. Clair, Pa.
119,801.—PEAT MACHINE.—W. S. Tisdale, New York city.
119,802.—BOTTLE OPENER.—C. B. Trimble, New York city.
119,803.—HUB.—O. Vanorman, Fond du Lac, Wis.
119,804.—SLEIGH.—R. Webb, Star Prairie, Wis.
119,805.—SHUTTER.—J. Weed, Muscatine, Iowa.
119,806.—FRUIT BOX.—C. W. Weston, San Francisco, Cal.
119,807.—HANDLE.—J. G. Wilbur, H. H. Hulbert, Kilbourne, Wis.
119,808.—SMOKE STACK.—E. H. Winchell, New York city.
119,809.—VENTILATOR.—E. H. Winchell, New York city.
119,810.—TURNING LEAVES.—A. Altenburg, G. J. Lambrix, Buffalo, N. Y.
119,811.—WHEEL.—E. Ball, Jr., Canton, Ohio.
119,812.—COMPOUND.—R. Bevill, Bowie County, Tex.
119,813.—SAW BLADE.—B. S. Bishop, Menasha, Wis.
119,814.—SEWING MACHINE.—O. C. Blakemore, Zanesville, O.
119,815.—BRUSH.—C. Brintzinghoffer, Philadelphia, Pa.
119,816.—HEATER.—G. F. Burkhardt, Boston, Mass.
119,817.—CONDENSER, ETC.—A. Cail, Paris, France.
119,818.—LARD COOLER.—A. E. Camp, C. L. Reid, Louisville, Ky.
119,819.—RUNNING GEAR.—E. P. Carter, Arcade, N. Y.
119,820.—SHINGLE BAND.—C. B. Choate, East Saginaw, Mich.
119,821.—MOVEMENT.—A. Clark, Albany, Ill.
119,822.—TANNING.—J. W. Coburn, Walpole, E. F. Winslow, Dedham, Mass.
119,823.—SPRING.—J. W. Cochran, New York city.
119,824.—FEED PIPE.—J. Cone, Bristol, Pa.
119,825.—INDUCTION COIL.—D. M. Cook, Mansfield, Ohio.
119,826.—ANIMAL TRAP.—J. F. Coppock, Dexter, Iowa.
119,827.—PAPER CUTTER.—E. Cowles, Cleveland, Ohio.
119,828.—TRAY.—D. M. Cummings, Enfield, N. H.
119,829.—RAILWAY TIE.—J. P. Dirner, Honesdale, Pa.
119,830.—COMPOSITION.—C. G. Dodge, Marshall, Mich.
119,831.—AXLE.—E. Doty, G. W. Miltimore, Janesville, Wis.
119,832.—FIRE BOX.—J. Durand, Columbus, Ohio.
119,833.—CLOCK.—S. F. Estell, Chicago, Ill.
119,834.—FIRE ARM.—G. H. Ferriss, Utica, N. Y.
119,835.—STEAM BOILER.—C. G. Fisher, Washington, D. C.
119,836.—PAVEMENT.—M. Fitzgibbons, New York city.
119,837.—TOOL.—S. J. Forbes, Marshalltown, Iowa.
119,838.—PIPE WRENCH.—D. Frank, T. Snyder, Allentown, Pa.
119,839.—BURNER.—T. S. Gates, A. H. Fritchey, Columbus, O.
119,840.—CHURN.—J. Gire, Louden City, Ill.
119,841.—WHEEL.—J. S. Graves, Lima, N. Y.
119,842.—LAMP.—F. T. Grimes, Liberty, Mo.
119,843.—PAPER.—B. E. Hale, New York city.
119,844.—HOOP.—E. C. Hamlin, Pavilion, N. Y.
119,845.—WASHER.—J. W. Hampton, Mount Pleasant, Iowa.
119,846.—FIRE ARM.—A. Henry, Edinburgh, N. B.
119,847.—CAR.—C. L. Hoag, E. Ely, Lockport, N. Y.
119,848.—LOOM.—J. Holding, J. Eccles, Manchester, Eng.
119,849.—CHAIR.—C. A. Jackson, Boston, Mass.
119,850.—PAVEMENT.—R. A. Jackson, S. Gissinger, Pittsburgh, Pa.
119,851.—KEY HOLE GUARD.—F. Jenny, Parkersburg, W. Va.
119,852.—PISTON.—D. Johnson, Ashland, Ohio.
119,853.—MATTRESS.—W. B. Judson, Poughkeepsie, N. Y.
119,854.—HORSE NAIL.—E. W. Kelley, Hamilton, Scotland.
119,855.—BATTERY.—J. Kidder, New York city.
119,856.—DUMPING CAR.—S. D. King, Middletown, N. Y.
119,857.—LOCOMOTIVE.—C. H. Lathrop, Jersey City, N. J.
119,858.—WATCH.—J. Laurent, New York city.
119,859.—WASHING MACHINE.—J. H. Lee, Marshall, Texas.
119,860.—BREAST PIN.—J. A. Lehman, Philadelphia, Pa.
119,861.—BREAD CUTTER.—C. Lemke, Cincinnati, Ohio.
119,862.—BED BOTTOM.—G. D. Leonard, Chicago, Ill.
119,863.—AXLE.—W. A. Lewis, Chicago, Ill.
119,864.—AXLE, ETC.—W. A. Lewis, Chicago, Ill.
119,865.—WELDING.—W. A. Lewis, Chicago, Ill.
119,866.—AXLE.—W. A. Lewis, Chicago, Ill.
119,867.—CAR WHEEL.—W. A. Lewis, Chicago, Ill.
119,868.—AXLE.—W. A. Lewis, Chicago, Ill.
119,869.—AXLE.—W. A. Lewis, Chicago, Ill.
119,870.—CHURN.—W. H. Link, Shanesville, Ohio.
119,871.—BALANCE.—C. C. Marsh, New York city.
119,872.—FRUIT BOX.—J. H. Marvil, Laurel, Del.
119,873.—TABLE, ETC.—M. J. Miller, Bloomington, Ill.
119,874.—RUDDER.—J. H. Moore, Deep River, and J. B. Clark, Chester, Conn.
119,875.—DIVIDER.—C. M. Nichols, West Greenwich, R. I.
119,876.—NEEDLE.—C. H. Palmer, New York city.
119,877.—AXLE BOX.—W. G. Parr, Normal, Ill.
119,878.—TRACTION ENGINE.—R. C. Parvin, Philadelphia, Pa.
119,879.—CARRIER.—R. Paulson, Washington, D. C.
119,880.—FITTING FELLIES.—W. L. Perry, Jonesville, S. C.
119,881.—SMOKE CONSUMER.—C. Plumb, Montreal, Canada.
119,882.—DESK, ETC.—J. L. Riter, Brownsville, Ind.
119,883.—CLEANING WELLS.—E. A. L. Roberts, Titusville, Pa.
119,884.—CLEANING WELLS.—E. A. L. Roberts, Titusville, Pa.
119,885.—CHIMNEY COWL.—J. G. Roth, New York city.
119,886.—SUGAR.—J. Schroder, Petschek, Austria.
119,887.—LAMP.—I. W. Shaler, Brooklyn, N. Y.
119,888.—UMBRELLA.—J. Shepherd, New Britain, Conn.
119,889.—WATCH.—H. B. Smith, R. Folsom, Cincinnati, Ohio.
119,890.—CLEANER.—I. Smith, New York city.
119,891.—INDICATOR.—J. S. Smith, Middletown, Conn.
119,892.—BROILER.—O. J. Smith, Wauwatosa, Wis.
119,893.—FIRE KINDLER.—R. P. Smith, Dubuque, Iowa.
119,894.—BOOK BINDING.—D. M. Smyth, Orange, N. J.
119,895.—TAPPING PIPES.—L. Spaulding, E. E. Guy, Norfolk, Va.
119,896.—TONGUING MACHINE.—D. F. Sutton, B. Meilink, Toledo, Ohio.
119,897.—COUPLING.—J. B. Tracy, Lincoln, Del.
119,898.—CHURN.—A. Traver, P. Nichols, Troy, N. Y.
119,899.—MAGNETIC MOTOR.—M. H. Utley, A. Ross, Montreal, Can.
119,900.—PUNCHER.—W. H. Van Cleve, Ypsilanti, Mich.
119,901.—DREDGER.—I. D. Vandecar, Chicago, Ill.
119,902.—BLASTING.—A. W. Von Schmidt, San Francisco, Cal.
119,903.—DRYER.—C. H. Wakelee, San Francisco, Cal.
119,904.—CULTIVATOR.—H. Weld, Black Walnut, Ill.
119,905.—INSECT TRAP.—T. Wier, Lacon, Ill.
119,906.—HORSE BOOT.—R. Williams, Philadelphia, Pa.
119,907.—CARRIAGE SPRING.—D. D. Wisell, Zanesville, Ind.
119,908.—CUT OFF.—W. Wright, New York city.
119,909.—HORSE POWER.—W. R. Wright, Barnwell Co., and D. A. Warnock, Beaufort Co., S. C.
119,910.—CUTTING STONE.—H. Young, Stamford, Conn., J. T. Young, New York city.

REISSUES.

4,579.—CLEANING RICE, ETC.—W. Ager, Washington, D. C.,—Patent No. 18,177, dated Sept. 15, 1857; extended seven years.
4,580.—HARNESS.—J. Bauer, Newark, N. J.—Patent No. 116,536, dated July 4, 1871.
4,581.—CULTIVATOR.—T. F. Bertrand, P. Sames, Rockford, Ill.—Patent No. 60,916, dated Jan. 1, 1867; reissue No. 4,309, dated March 28, 1871.
4,582.—HARVESTER.—E. D. Buckman, Philadelphia, Pa., S. A. Sisson, Hoosick Falls, N. Y.—Patent No. 16,957, dated April 7, 1857; extended seven years.
4,583.—MOVEMENT.—J. Hanley, New York city.—Patent No. 18,845, dated Dec. 15, 1857.
4,584.—AXLE.—W. A. Lewis, Chicago, Ill.—Patent No. 108,607, dated Oct. 25, 1870.
4,585.—Division A.—BASE BURNER.—D. G. Littlefield, Albany, N. Y.—Patent No. 30,333, dated Oct 9, 1860; antedated July 3, 1860; reissue No. 1,303, dated April 22, 1862.
4,586.—Division B.—GRATE.—D. G. Littlefield, Albany, N. Y.—Patent No. 30,333, dated Oct. 9, 1860; antedated July 3, 1860; reissue No. 1,303, dated April 22, 1862.
4,587.—PACKING.—W. H. Miller, Philadelphia, Pa.—Patent No. 73,454, dated Jan. 21, 1868.
4,588.—INDUCTION COIL.—P. W. Page, Washington, D. C.—Patent No. 76,654, dated April 14, 1868.
4,589.—TRUSS.—J. W. Riggs, Brooklyn, N. Y.—Patent No. 22,674, dated Jan. 18, 1859.
4,590.—SPRINKLING CART.—P. Rodenhausen, Philadelphia, Pa.—Patent No. 67,805, dated August 13, 1867.
4,591.—ARTIFICIAL ASPHALT.—A. B. Vandemark, Jersey City, N. J.—Patent No. 117,946, dated August 8, 1871.

DESIGNS.

5,307.—SUGAR TONGS.—J. Hall, 2d, Wallingford, Conn.
5,308.—SASH HOLDER.—A. W. Lawrence, Raleigh, N. C.
5,309 to 5,311.—OIL CLOTH.—C. T. Meyer, Lyon's Farm, N. J.
5,312.—TABLE CASTER.—D. Sherwood, G. D. Dudley, Lowell, Mass.
5,313.—SEWING MACHINE COVER.—J. Wilson, Boston, Mass.

Inventions Patented in England by Americans.

September 19 to September 25, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

BRUSH.—C. D. Rogers, Utica, N. Y.; M. P. Wilkins, Jersey City, N. J.; H. A. Harvey, Orange, N. J.
FIRE ARM.—F. J. Abbey, J. H. Foster, Chicago, Ill.
GLASS LIGHT.—V. E. Mauger, New York city.
LUBRICATOR.—J. Harper, New Haven, Conn.
PICK, ETC.—C. A. Hardy (of Philadelphia, Pa.), and A. E. Stayner (of Halifax, N. S.), Sheffield, and J. Harrison, Eastwood, England.
PLAITING MACHINE.—G. E. King, New York city.
PREPARED PAPER.—S. S. Lewis (of Boston, Mass.), London, England.
QUILTING MACHINE.—W. J. Tate, H. R. Mitchell, Philadelphia, Pa.
SHAFTING PICKS, ETC.—C. A. Hardy (of Philadelphia, Pa.), and A. E. Stayner (of Halifax, N. S.), Sheffield, England.
SPRING.—B. Hershey, E. Geer, R. Dudley, R. F. Gaggin, Erie, Pa.
TYING PARCELS.—M. A. Mauger, New York city.
TYPE COMPOSING AND DISTRIBUTING MACHINE.—V. E. Mauger, N. Y. city.
VALVE MOTION.—W. Livingstone, Brooklyn, N. Y.

APPLICATIONS FOR EXTENSION OF PATENTS.

MOWING MACHINE.—Henry Fisher, Canton, Ohio, has petitioned for an extension of the above patent. Day of hearing, December 27, 1871.

CARPENTER'S RULE.—L. C. Stevens, Pleasant Valley, Conn., has petitioned for an extension of the above patent. Day of hearing, December 27, 1871.

City Subscribers.—The SCIENTIFIC AMERICAN will be delivered in every part of the city at $3·50 a year. Single copies for sale at the News-stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Advertisements.

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.

RATES OF ADVERTISING.

Back Page - - - - $1·00 a line,
Inside Page - - - 75 cents a line
for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.